GAS JOURNAL

LIGHT ✂ HEAT ✂ POWER ✂ BYE-PRODUCTS

(Founded in 1849 as the "Journal of Gas Lighting.")

PROPRIETORS: WALTER KING, LIMITED. OFFICE: 11, BOLT COURT, FLEET ST., LONDON, E.C. 4.

Telephone: Central 6055. —— Telegrams: "GASKING, FLEET, LONDON."

VOL. CLXXXI., No. 3382.] WEDNESDAY, MARCH 14, 1928. [80TH YEAR.

Editorial Notes.

Royal Charter for the Institution.

IN the "JOURNAL" for Feb. 15, editorial reference was made to the proposed petition for a Royal Charter for the Institution of Gas Engineers, and we commented upon the complete justification for this recognition that the Institution possesses—through the length and dignity of its work, and the service it has rendered to scientific progress, to the community, to the nation, and to industrial development—which recognition would improve its status, and that of its members. In the article referred to, indication was also given of the lines that the petition would take. A revised copy of it is before us. Constitutionally it remains much the same as it was a month ago, though in certain respects there has been a little verbal modification. A proof of the draft of the Royal Charter and the By-laws also makes interesting reading, but it would be a breach of etiquette to make any extended extracts from them, in view of the fact that they were only before a special meeting of the Council on Monday, and will not be submitted to the members as a body before the special meeting convened for April 2.

It may, however, be permissible to make allusion to two or three small points referring to the scheme embodied in the by-laws which will enlarge the area of membership, while maintaining inviolate the technical attributes of the organization. The by-laws propose that the Institution shall consist of members and associate members, who will be known as corporate members; and honorary life members, honorary members, associates, and students, who shall be non-corporate members. There are one or two points in the section referring to candidates for membership which perhaps would be improved by a little definition or modification. It is provided that "every candidate for election or transfer into the class of member shall be actually engaged in a responsible technical position in the gas industry," and shall come within one of the conditions which are appended. In this connection, there should be some definition of the term "gas industry," in order that no doubt may exist as to whether it embraces all who hold responsible technical positions in any part of it. Does the "gas industry" include those who make gas plant and gas-using appliances and apparatus? We think it does, because "gas industry" means the whole, and not a part. However, whatever is intended should have positive interpretation, so that in future there may be no dispute through ambiguity. The conditions provide that the candidate shall be the holder of the diploma in gas engineering or gas supply of the Institution or of the predecessors of the Institution, in which case he shall, save as aforesaid, require no further qualification; or the candidate shall not be under 30 years of age, and either (1) shall for at least five years at the time of his application have held the responsible position in the gas industry as head of a technical department, and either (*a*) be an associate member of the Institution, or (*b*) be a corporate member of the Institution of Civil Engineers, or (*c*) possess a B.Sc. degree of a British University, or such other degree as in the opinion of the Council is an equivalent scientific or engineering degree. We suggest that the words "B.Sc. degree of a British University" should be supplemented by categorically stating that it refers to an engineering, chemical, or other suitable degree, although, of course, this is implied. The section referring to associate members does definitely say a "B.Sc. degree of a British University in Gas Engineering," and that we think might be expanded.

But returning to the membership conditions. It is alternatively provided (2) that the candidate "shall have had, in the opinion of the Council, a suitable education and training in the gas industry, and shall, for at least fifteen years at the time of his application, have held a responsible technical position in the gas industry, and shall, in the opinion of the Council, have acquired a considerable degree of eminence in the profession of an engineer in the gas industry." We are at a loss as to what precisely is meant by a "responsible technical position in the gas industry." Much depends upon the meaning attached to the words. Let us see whither the clause leads. In the first place a person must have a suitable education and training in the gas industry. Supposing a youth starts his training for the gas industry at the age of 16, and devotes at least five years to the training. He would then be 21 years old. He becomes a junior assistant and later a senior one. Are those offices to be included as "responsible" positions, when working to the instructions of a chief? Some years may pass before the assistant secures the "responsible" position of chief. Then he must have held for at least fifteen years at the time of his application a "responsible" technical position in the industry. Unless responsibility begins at the end of his training, we can see many a man on the technical side of the industry approaching the fiftieth anniversary of his birthday before he would be qualified for membership of the Institution; and then he might ask himself whether it was worth while. We quite admit that it might take him all those years to acquire a "considerable degree of eminence in the profession of engineer in the gas industry;" but again we ask, What is "a considerable degree of eminence" in that relation? Perhaps, however, "a responsible technical position" includes the years in the office of assistant, seeing that one of the conditions for associate membership is that the candidate "shall at the time of his application hold a responsible technical position in the gas industry."

Very properly and usefully it is contemplated that the Council shall have wide powers in respect of the election of associates. These "shall be persons not under 21 years of age, who, by reason of their professional knowledge or experience, are considered by the Council qualified to assist in promoting the objects of the Institution."

We think that a little elucidation or modification of doubtful points affecting membership in the new by-laws would certainly be of advantage. Perhaps the Council dealt with some of them at their meeting on Monday.

Bulk or Normal Carbonization in Gas-Works.

There was such a plethora of material and detail at the recent Carbonization Conference that it is impossible to comment upon it all; but there are points which should be noticed in order to give them emphasis. We will refer to two or three this week; but, as a preface, it may be said that the papers were excellent, and so were several of the discussions. They showed, on the one hand, the advantage of men associated with the different carbonizing industries getting together and discussing matters from their different angles, but, on the other hand, they also illustrated the difficulty in so doing of arriving at definite conclusions on several subjects, which points to the necessity of something succeeding open discussion in the way of the interests concerned having, by competent representation, a round-table conference to consider and determine upon the points at issue.

Our coke-oven friends appear to be astonished that the gas industry has not introduced coke-oven plants into its equipment—at any rate, in the case of the larger works. The Birmingham Corporation Gas Department many years ago did adopt a coke-oven plant; but their carbonizing capacity has since been extended along the lines of modern types of retorts specially designed for the primary purpose of a gas undertaking, which is the making of gas therms on the best terms in relation to net cost. Our coke-oven friends have not viewed the matter from the same standpoint as a gas engineer has to do. They speak, for instance, of the small ground space occupied by coke-ovens on the basis of gas production per square foot; but they do not tell us explicitly what is included in the ground space occupied—whether all essential and heavy accessories for dealing with large weights are included. Too much can be made of gas production per square foot of ground space occupied. The gas industry is proud of its achievements in this respect, seeing that there are many examples of modern plants producing 75 to 100 p.ct. more gas on a given area than the plant which previously occupied the same site; but gas engineers also believe that the efficiency of a carbonizing plant is subscribed to by a freedom of access for working operation and supervision. The point was raised on the contributions of Mr. Thomas Hardie at the first session; and Mr. E. G. Stewart, who was representing him, submitted that an important consideration for gas undertakings was the make of gas therms per ton, and we have yet to find the coke-oven plant which will give, from similar coal, 72 therms of straight coal gas per ton carbonized as is the case with horizontal retorts. The coke-oven experts hold up their labour and maintenance costs for admiration; but the loss of 4 or 5 therms per ton of coal is, as Mr. Stewart says, something that requires a good deal in the way of compensations from other economies. However, from the gasmaker's point of view, it is better, having regard to the variations in coal and conditions, to take the overall costs of production per therm rather than the thermal yield per ton or per square foot of area occupied by the plant. And Dr. E. W. Smith regards it as infinitely better to take the thermal yield of the plant per day than the thermal yield per ton or per square foot of area; a high thermal yield per ton may be nullified by a low thermal yield per day. In other words, one has to determine the critical or most profitable stage between thermal yield per ton and thermal yield per day. There are, however, so many factors to be taken into consideration in this connection that, in the view of Mr. T. F. E. Rhead, the most satisfactory or profitable stage can only be settled by a qualified accountant after close investigation. He is right.

Another consideration that the coke-oven technicians place before the gas industry is the low fuel account of coke-ovens per lb. of coal carbonized. Mr. L. H. Sensicle, referring to a plant making 20 million c.ft. per day, calculated the fuel consumption at from 800 to 900 B.Th.U. per lb. of coal carbonized; but other authorities put the figure at more like 1000 to 1100 B.Th.U., though these are not without hope of reduction of the heat required. Then a point that is made in opposition to coke-ovens for gas-works is that in many cases these are situated in residential areas, and therefore coke-ovens could not well be operated there, for very good reasons. Of course, there are numerous works in industrial areas where the same objection would not hold good, though, from the wartime point of view, there might in some vulnerable quarters be reasons why the ovens should not then be used.

But taking the proceedings generally so far as they related to the adoption by the gas industry of bulk carbonization in coke-ovens, it is rather interesting to find advocacy of this coming from our coke-oven friends. It has also been advantageous to have them in open discussion with technical men from the gas industry, because the net result is to show that the question is one of some complexity, which cannot be settled by the postulation or the affection for his type of plant of the coke-oven technician, or by mere speculation as to what would happen by such adoption on the part of gas engineers. Until there is thorough investigation by the gas industry on a working scale from every aspect, the whole of the points at issue cannot be settled. It was suggested in the discussion that, with its large resources, no undertaking is better fitted to put coke-ovens through their paces for gas-making purposes than the Gas Light and Coke Company. We should never be surprised to hear of a favourable decision to that end—in fact, there cannot be the slightest doubt that the matter has been probed from time to time by the responsible engineering chiefs of the Company. But the prospects of such a trial have to be calculated, and so has the cost (which would not be light) in relation to the chances of success. Here for the time being the matter must be left.

Coke-Oven Gas and Domestic Coke.

We rather expected to hear more at the conference regarding the supply of coke-oven gas to gas undertakings. But enough was said to show that the coke-oven industry dearly wants all the business it can get in this direction. It is essential to its economic development; but so far as gas undertakings are concerned, it is a question of price and reliability of supply. It could not be expected that the coke-oven representatives would be pleased with the results of an investigation into this question made by Mr. Thomas Hardie, which were incorporated in the address he delivered to the Western Junior Gas Association, as printed in the "Journal" for Feb. 8, and commented upon in the issue for Feb. 15. It will be remembered that, in comparison with an assumed net cost of 1s. per 1000 c.ft. into the holder of home-produced gas, he set out charges which should be made as deductions from the value of coke-oven gas, and, in the result, submitted that the net price of coke-oven gas should be 3½d. per 1000 c.ft., or 0·7d. per therm. But, of course, he did not submit this as having common application, but as applying only to a definite set of conditions, and, therefore, furnishing a basis for discussion as to the factors which should be taken into consideration in determining the price that should be paid from the standpoint of a gas supplier. There are, of course, items other than the relative cost into the holder to be taken into consideration—such as mains, stand-by costs, increase in overhead costs per unit, and reasonable allowance in the shape of "gain" in comparison with the home production. Having regard to such considerations and deductions, Mr. Hardie doubted whether in some cases all the financial liabilities of a gas undertaking had been brought into account in fixing the prices paid for coke-oven gas. There was some question at the conference as to the correctness of Mr. Hardie's computations; but there was only generalization, and not definite challenge by the presentation of contra figures.

It is manifest that nothing definite could issue except on a case the whole of the conditions of which were known; and therefore no real good could come from general discussion on the matter at such a conference as this. What is wanted is, as Dr. Smith says, that the factors which should be taken into account in determining the correct price to be paid under any given conditions should be settled for guidance; and this could only be done by competent coke-oven men and gas engineers getting together and privately hammering-out the matter. If this idea commends itself, the best way to carry it through would be

by the Institution of Gas Engineers and the Coke-Oven Managers' Association appointing a Joint Committee to consider the factors and to report upon them. Mr. Hardie has furnished the basis on which such a Committee could commence work; and therein is part of the value of the case he made, in the address to which we have referred, for full consideration being given to the question. The other part of the value is in the influence his suggestions will have in inducing gas managements who may be contemplating entering into, or who hereafter enter into, contracts for coke-oven gas to examine well the factors relating to the financial side of the bargaining before finally committing themselves. The coke-oven industry cannot blame gas undertakings for having complete regard to their own conditions, and taking into account all the costs involved by the transfer of production from the gas-works to the coke-ovens. An apposite point was made by Mr. R. H. Ruthven, when he said, in effect, that the cost of gas manufacture is decreasing in gas-works, while the cost of distribution is increasing and consumption is being developed by the aid of augmented liabilities, some of which are necessitated by competition.

A little more was heard regarding the idea that coke-oven owners should be in the position to supply industries with gas direct without the intervention of gas undertakings. This, of course, is a submission which the gas industry could not endorse, having regard to its statutory rights, and to its own ability to meet the industrial demands—an ability which is progressively improving. The proposal as to a "gas-grid" system, with its source at coke-oven works, also peeped out here and there during the proceedings. With such a distribution system, the coke-oven owners see the means of developing business, not only with large gas undertakings, but with small ones, which they could not possibly do without the custom of the larger concerns. With such a scheme, it is obvious that their case would be much stronger for the supply en route of large manufacturing establishments. The more important gas undertakings are already extending their areas, and the gas industry has a stronger preference for small "grids" from their own works than larger "grids" from the coke-oven plants; as well as for developing along the lines which their existing statutory powers give them, or which the extension of those powers may shortly confer upon them. But our coke-oven friends may rest assured that, if prices are right, and the constancy of supply can be assured, the gas industry's absorption of their gas production will grow to much greater magnitude in the future than it has at present under the contracts now existing, or which are awaiting consummation. We were pleased to see from a statement by Mr. R. Ray that every precaution in regard to coal stocks and men has been taken in connection with the latest contract entered into by the Sheffield Gas Company.

No secret was made of the fact that the coke-oven industry are also out for considerable business in coke for domestic purposes. Its sales are increasing, and Mr. W. Green, of the Manvers Main Collieries, urges that the policy in this respect should be a forward one, and that, by a suitable sales organization, it should be pressed to its utmost limits, in order to secure a wider solid fuel market for the industry. As a matter of fact, this is regarded, combined with the sale of the gas produced, as a matter of vital necessity for the extension of the coking industry, and for realizing greater trading stability than it now possesses. There was candid speaking at the conference; and the gas industry was plainly told that, if it wishes to prevent the coke-oven industry making further inroads into the domestic coke market, it must set its own house in order, and use washed coals for carbonization. The coke-oven industry intends to force the pace on the grounds of quality and suitability; and it is confident that, by the selection of appropriate coal and blending, with treatment, under proper temperature conditions, it can supply a coke of any quality that is required for domestic purposes.

That is the position. But the coke-oven plant itself must be suitable, or there will be great variations in the quality of the coke. In this respect, the width of the oven is of importance, as it governs the rate of heat penetration through the charge. Mr. Sensicle says that, with a 14-in. wide coke-oven, it is possible to make coke equally as reactive and as acceptable for household use as that made by any other plant. The carbonizing time with retorts of that width corresponds very closely to horizontal retort working, and the rate of heat penetration is very similar. Therefore, admittedly, the coke should be, given the same coals, very like gas coke in regard to combustibility and reactivity. In a 14-in. oven, the carbonizing period would be (say) 11 hours; but with an 18-in. oven, it would be about 15½ hours. The greater the width, the greater the increase of the coking time; and the greater the coking time, the greater the variability of the coke from the oven and its degree of combustibility, owing to the portion of the charge next to the oven surface being exposed to the severest heat for the longest period. But even under suitable carbonizing conditions, for some domestic purposes oven coke is far from being so free-burning as that from (say) continuous vertical retorts. Its very texture, which is an advantage for such purposes as central heating and coke-boilers for water heating, is a disadvantage in the open fire. A similar coke to that made by coke-ovens for the domestic purposes named can be produced, as Mr. John Roberts and Mr. Ruthven have shown, in intermittent vertical retorts; the notable difference being that, where washed coal is not used, the ash content is higher. Further, by the simple expedient of blending coals, a great difference can, in any system of gas-works carbonization, be made in the texture of coke. In view, however, of the variations in the texture of coke from the different carbonizing systems, the products of which have their own fields of suitability, there must be agreement with Mr. T. F. E. Rhead that the various systems of carbonization will continue in existence—no one system will oust the others. However, to coke-boilers for water heating and central heating the gas industry has been looking for greater developments of the business in coke; and it is clear that, with increasing competition, greater attention will have to be paid to quality than has been the case hitherto, and quality means the cleansing and probably blending of coal.

Anyway, there can now be no uncertainty as to the intention of the coking industry to exploit to the full the domestic coke market. One advantage that gas undertakings have over the coke-oven industry is that the markets for coke surround the gas-works, and therefore the cost of transport is not great. But that advantage can be annulled by the offer of better quality at an equivalent price. In our opinion, there are facts in the discussions at the Carbonization Conference concerning this latter-day competition over which the gas industry should ponder deeply.

What is a "Chemical Engineer?"

THE Institution of Chemical Engineers is a robust body, which has become soundly established, is doing excellent work, and is looking forward to a big future. Ever since its advent, the question has been asked, "What is a chemical engineer?" The organization itself does not appear to have hit upon a terse definition which is generally acceptable. At the annual dinner last Friday, the question was again raised; but nothing in the way of a fresh, crisp definition was offered. It seems to us the scope of the term defies anything of the kind. "Chemical engineering" has so many spheres and phases. There are the men who design and invent plant for the making of chemicals, and plant for processes that are fundamentally chemical. Every gas engineer, we should imagine, is entitled to be called a chemical engineer; for every one of his processes is essentially chemical, and, moreover, he produces much of the raw material required by the light and heavy chemical industries. Then there are engineers who have to assure themselves that the chemical and physical characteristics of the materials used in the making of the plant which is their speciality are correct for the purpose; and to obtain the necessary knowledge they have to make research. It seems to us that the title of "chemical engineer" has a remarkable comprehensiveness which it is difficult to compress into few words. It would, we imagine, be an easier task to name those engineers who are not in any way concerned in chemistry than to name those engineers who are. The Institution of

Chemical Engineers has drawn into its ranks men of considerable attainments and influence in chemical engineering; and those who are primarily and actively concerned in its work are looking to an ever accumulating strength through the enlargement of membership.

Public Lighting Policy and Expenditure.

When conversions from gas to electricity for public lighting are made by municipal authorities, who are the owners of the electricity undertakings, electricity takes the cream of the lighting in the central part of the city or town, and the gas-lamps that remain are more widely distributed and oftentimes extend into the outer parts. The result is that the average cost of attention to the gas-lamps is greatly increased. That is obvious to anyone who is acquainted with the conditions of maintaining public lighting. Of course, it cannot be expected that laymen would be cognizant of this, or of other matters that contribute to producing differences in the cost of public lighting. A correspondent of the "South Wales Argus" recently referred to the variation between the charges made by the Newport (Mon.) Gas Company for street lighting and by the Corporation Electricity Department; the comparative figures that he quoted being £7 10s. per lamp for gas, and £6 17s. 6d. for electricity. The letter and the figures show an entire want of appreciation on the part of the writer of the factors which cause the difference; and he had nothing to say regarding relative efficiencies, or, in other words, illumination value in relation to expenditure. The letter naturally was not written with the intention of assisting the Gas Company; but Mr. J. H. Canning, the Engineer and Manager of the Gas Company, has enlightened the writer and the public through the columns of our local contemporary, and what he says would apply to many other boroughs. When the present agreement as to the price charged for gas-lamps was entered into in 1922, there were 525 public gas-lamps in the borough; the number has since been reduced to 370. The deliberate policy of the Electricity Committee (who until recently were in charge of the public lighting) was to convert the gas-lamps in the main public thoroughfares, in the central and more accessible portions of the town. The result is that the men in charge of the gas-lamps have to traverse long distances in order to attend to isolated groups of two or three lamps, and even in some cases single lamps only. This means a considerable increase in the average standing and labour charges per lamp. Moreover, the prices quoted in the letter are not for the lighting of the main thoroughfares, but for the lamps in the less important streets.

Among other things which the layman critic does not know is that, in the case of gas lighting, the mantles are cheaply renewed, and thus the illumination has constant maintenance at its maximum, whereas with electric lamps there cannot be renewal without completely changing the old bulbs. Consequently, the illumination afforded by the electric lamps is steadily on the decline throughout their working life. Comparative tests which were made some time ago at Newport, showed that twin bijou gas-burners as then used were, on the average, giving nearly double the quantity of light yielded by the corresponding type of electric lamp. It is patent that, if electric lighting was so far superior for the purpose, and more economical and more reliable than gas, local authorities who are responsible for this public service, and who do not possess electricity undertakings to create a bias in policy, would not continue to use gas for the purpose to the extent that they do at the present day. When it is realized that of the aggregate public lighting in Great Britain about 87½ p.ct. is carried out by gas, this tells a tale of superiority in respect of economy, efficiency, and reliability. Any gas company who is allowed to compete with an electricity department for the lighting of the central portions of an area of supply can quote lower figures for the entire area than they can do when the kernel of the lighting is given to electricity, and only the husk to gas. Moreover, that is not the whole tale. We have known of cases where electric lighting has been installed in the nicest quarters of a town; and then shortly after the matter has been settled in favour of electricity, it has been found that it would be better to use higher candle-power lamps. This is followed by an increase in the charges for the electrical service. The thin end of the wedge is sometimes very thin indeed, but it is wonderful how acutely in some cases the wedge broadens out in order that the electricity undertaking may not suffer, and that there may not be open discussion of the costs in comparison with gas. In public lighting policy in some boroughs, we have seen finesse of the richest quality.

British Industries Fair, 1929.

The Council of the Society of British Gas Industries are gratified at their success in organizing, in conjunction with the Birmingham Corporation Gas Department, the Gas Section of the British Industries Fair at Birmingham. A resolution (as announced elsewhere in this issue) has been passed that a Gas Section shall be carried out next year.

The Gas Fund.

The Board of Trade are continuing, for 1928, the rate of contribution to the Gas Fund at 1s. per million cubic feet of gas sold; the basis of calculation being the sales last year. The contribution should be paid on or before April 1.

Rating of Machinery in London.

The House of Commons have given second reading to the Rating and Valuation Bill, which is to carry out various undertakings made by Mr. Neville Chamberlain during the passage of the 1925 Rating Bill. A clause dealing with London was dropped from the latter measure on the report stage. There is no prospect of securing the passage of a complete Rating Bill for London this session; but the Government now desire to extend to the Metropolis the relief in regard to the rating of machinery which was given to the rest of the country by the Act of 1925. Another point is that valuation in London is founded on an Act passed in 1869, which provided that London should be valued every five years. The next valuation will be in 1931. But the 1925 Act comes into operation in 1929; and the present measure will put London on the same footing as the rest of the country.

Dr. Ferranti's Oversight.

Delivering a "Faraday" Lecture in the Mappin Hall, Sheffield, Dr. S. Z. de Ferranti expressed the belief that the great development in the use of electricity depends principally upon the improvement in the means of storing energy, the attitude of the women of the country to the uses of electricity, and the efficiency with which electricity is sold. Electrification of the homes of the country will, he considers, be the next great want to be met; and it is high time that all the skill of the electrical engineer was brought to bear upon the great social problem of how to save labour in the home, and to remove the drudgery which has been all-absorbing in the past. Dr. Ferranti appears to have overlooked the fact that household drudgery has been largely removed by the success of the gas industry in displacing coal ranges by gas cookers and water heaters, and coal fires by gas fires. But for the oversight there was partial compensation in the expression of his regret that the general selling of electricity in the country is in no way comparable to the selling of the product of a great competing industry. The electricity industry, knowing its inferiority in thermal value for money expended, has not the same incentive as the gas industry. If Dr. Ferranti wants to learn something as to relative popularity of gas and electricity in domestic work, he should study the statistics as to the therms sold respectively by the two industries. They are rather convincing. He might go farther and explore the therms expended in providing the therms actually sold.

Utility Undertakings to Pay.

Collieries which produced 91 p.ct. of the coal mined in Scotland last year have signed agreements which bring into being a scheme for remedying the depressed condition of the industry. It provides for the closing-down of collieries by agreement, and the payment of compensation to them from a fund which will be raised by a levy not exceeding 6d. per ton on all coal sold for home consumption by collieries that continue to

operate. The Committee appointed to carry out the scheme have, report says, now advanced prices to the extent of 1s. 6d. per ton in the case of all new contracts with utility concerns "such as gas and electricity works, institutions under the charge of public authorities, and railway companies."

Miners and the Selling Schemes.

One of the officials of the Yorkshire Coal Miners' Association calculates that the coal-selling scheme will in that county alone result in some 6000 to 10,000 miners being thrown out of employment. The men are inclined to the view that the closing-down of certain pits is due to the preparations that are being made for the inauguration of the scheme. There is, however, no confirmation of this.

Miners' Federation Finances.

The Miners' Federation is not in a financially flourishing state. The annual report has had private circulation; but information from it has leaked out. It appears that the total income of the general fund for the year to June 30 last was £32,623; and there is a debit balance of £949. Of course, the year included five months of the coal stoppage. Missions to other countries during the stoppage cost £745; and Executive and other conferences £7348. The "T.U.C." took £7500 in affiliation fees. The President (Mr. Herbert Smith) drew only £72 during the year; but Mr. Cook's share was £412, *plus* £196 for rent, rates, and coal. The income side shows that Yorkshire contributed £5624, South Wales £4854, Scotland £3500, Lancashire and Cheshire £1887, Northumberland £2111, and Durham £3750. On the political side the expenditure totalled £19,625. The mining members of Parliament drew £17,876, of which £11,937 was recovered from the Parliamentary allowance of £400 to each member—leaving a net cost to the Federation of £5938.

PERSONAL.

The Council of the Society of British Gas Industries have pleasure in announcing that the Marquess of HARTINGTON, M.P., has accepted the Presidency of the Society for the ensuing year.

Mr. HAROLD TALBOT, B.Sc., A.R.C.Sc., M.I.Mech.E., General Manager of the Welsbach Light Company, Ltd., and Chairman of the Lighting Section, has been nominated as the representative of the Society of British Gas Industries at the International Illumination Commission to be held in America in September next.

The British Colliery Owners' Research Association have appointed Mr. JAMES S. CARSON, B.Sc., to the post of Technical Investigator. Mr. Carson, who holds the Diploma in Mining of the Heriot Watt College, Edinburgh, and the B.Sc. degree in Mining and Metallurgy of Edinburgh University, was formerly employed by the Lothians Coal Company and later by the Cramlington Coal Company, and at present occupies the position of Under-Manager at one of the collieries of the Ashington Coal Company.

The Malvern Urban District Council have increased the salary of their Gas and Electrical Engineer, Mr. E. D. WOOTTEN, by £100 per annum, as from April 1.

BRITISH INDUSTRIES FAIR (BIRMINGHAM).

A Gas Section for 1929.

The Council of the Society of British Gas Industries, at their meeting last Wednesday, expressed their gratification at the success of the Society in organizing, in conjunction with the Birmingham Corporation Gas Department, the Gas Section of the British Industries Fair, Birmingham. After some discussion, the following resolution was passed unanimously:

> That the Society shall organize a Gas Section for the British Industries Fair, 1929, and shall invite the National Gas Council, the British Commercial Gas Association, and the Birmingham Gas Department to elect two representatives each to the Society's Exhibition Committee, and that Mr. Rogers be asked to act as Hon. Secretary to the Committee.

ELECTRICITY SUPPLY MEMORANDA.

Cold Water.

COMPETENT critics are still inclined to pass strictures on the ill-informed politicians who led the public to expect so much from the 1926 Electricity Act. The Chairman and Managing-Director of the Newcastle-upon-Tyne Electric Supply Company is Mr. R. P. Sloan. Addressing the Middlesbrough Chamber of Commerce recently, he deliberately asserted that the general public had been induced to anticipate too much in the way of lower prices for electricity as a result of the operation of the Act. Perhaps no man ought to know better what is possible in this regard than the head of the imposing Electricity Supply Company operating on the North-East Coast; and his knowledge is that of other managers of large power stations distributing over wide areas—such as the Yorkshire Electric Power Company. However, Mr. Sloan has never believed that the operation of the Act would result in a cheap and abundant supply throughout the country. It may be abundant; whether it will be cheap, has yet to be seen. All the advantages Mr. Sloan can find in the "grid" is that it will enable future super-stations to be located away from the centres of population where there are ample supplies of water, and where good transport facilities are available, without adding further congestion to densely populated areas. It will also tend to open-up certain new areas of supply, though not, he is afraid, to the extent generally supposed. He questions, too, whether it will be possible to tap the grid without incurring an expenditure of some tens of thousands of pounds on each connection. The transforming plant will cost a pretty sum. A less competent judge of these matters is the Minister of Transport. Of course, he speaks as he is informed. In a speech at the annual dinner of the Electrical Wholesalers' Federation recently, he spoke of the scheme providing electricity "for all;" but advertising and propaganda are essential if the electricity industry is to enlarge its borders, and take hold of the rural areas. We can leave it there. Readers can easily judge of the relative competence of Mr. Sloan and Col. Wilfrid Ashley to express opinions as to what the scheme is likely to do.

The Freakish Electrical Home.

The electrical industry is proud of the Futurist House which has been constructed at the Ideal Home Exhibition at Olympia, from the designs of Mr. R. A. Duncan, of Percy Tubbs, Son, & Duncan, in conjunction with the British Thomson-Houston Company, Ltd. It is a well-conceived spectacular display, without any considerable utility, so far as the present day is concerned. People are interested and amused; and therefore probably the promoters are satisfied, although the result may be to give the public the impression that electrical operation is not for the mass, but only for those individuals whose financial status is measured by seven figures. In this house there is an entrance hall and one large room, which, by patent roller shutters accommodated in the ceiling, may be divided at will into a dining-room, living-room, and study. One large bedroom, with four bunk bedrooms, suffice for sleeping accommodation. All the lighting, heating, &c., is by electricity; the load for the total equipment being somewhat above 40 KW.H. Something like two miles of cable were required, and upwards of 1000 lamps are fitted. A fountain and waterway in front of the house is illuminated by a great number of coloured lamps, which, being arranged on three separate circuits, alternately illuminate the water by purple, green, red-amber, &c. The garden is also illuminated by coloured lamps; and flood light projectors, each fitted with a 500-watt lamp, add to the illumination. A veranda is illuminated from wall fittings. The lighting of the entrance hall is by coloured lamps above a glass ceiling. In the living-room, the illumination can be of any desired colour. A wireless set, a telenews writer, dictaphone and television apparatus, and a gramophone all have their place in this wealth of electrical equipment. In the kitchen there is an electric oven, and hot-plates, refrigerating plant, geyser, washing and ironing machines, and so forth. A central cleaning plant, with suction tubes leading to all parts of the building, is provided. There is no staircase; an electric lift takes the residents to the upper floor, and brings them down again—providing always the energy does not fail at inconvenient moments. Tubular lamps are used for the illumination of the main bedroom, in which is an amplifier and a loud speaker in one of the wall panels. Why the amplifier and loud speaker are required in the bedroom is not particularly obvious, although it might be useful with some people at the time they should awaken. This may be all the more necessary in view of the fact that the beds are equipped with electric blankets. In the bath and exercise rooms, the illumination is by approximately 150 lamps accommodated in special receptacles. Why so many lamps should be required is a mystery. Then artificial sunlight and other appliances for health and hygiene form part of the equipment. For heating there are electric panels in the floors and an ozone air-ventilating system has also been installed. The clocks are magnetically operated, and an automatic telephone system is provided,

In the future, too, we see that the motor car and aeroplane will be combined in one structure, so that it can fly or traverse the roads as the occupant desires. This will be highly convenient for highway robbers and burglars. It is a pretty picture, but that is all.

An Internal Critic.

The Birmingham Electric Club has had a lecture from Mr. W. J. Forster, in which he enlarged on the advantages of the domestic load from the suppliers' point of view. We will not question that; but he is not so convincing on the question as to whether the domestic user finds the load altogether advantageous. After reading an epitome of the lecture, had we no other knowledge of the subject, we should say the consumer would not find it advantageous. Mr. Forster does not like small electric radiators of about 600 watts per hour which are fitted with an adapter, and are intended to be taken off an ordinary lamp socket. He is strongly of opinion that the socket-and-plug connection is much safer, and more reliable, for radiators. However fitted, we should not like even a 600-watt radiator. They are useless things, except to run up an electricity account, especially when the current is tapped from the lighting circuit. Fancy using electricity at 6d. per unit for heating! Even a 600-watt radiator would, with steadfast resolution, spin away with 3·6d. per hour; and the room would only be receiving for this expenditure heat at the rate of 2046 B.Th.U. per hour at 100 p.ct. efficiency. Passing on, we find that Mr. Forster appears to be rather sceptical about electric cookers. The modern model, he alleges, has been greatly improved, but is still imperfect; and the greatest need is for improvement on the hotplate. The modern electric hotplate (what a misnomer!) has a somewhat longer life than its predecessors, which is something, though little enough, for which to be thankful, but Mr. Forster admits that it is still remarkably inefficient. The critic also asserts that the initial cost is a serious matter; roughly, it is twice as much as that of a gas cooker of similar size. Because of this, hire charges have to be about double. In his opinion, pressed steel should be used for cookers, so that they might be made on mass scale, and thus lessen production costs. Among a few wrinkles for electric cooker makers, he speaks of earthing, pointing out that, if a cooker becomes alive, and a person using it sustains a shock, it would be a most unpleasant thing for the person, and for the reputation of electricity. There is also adverse comment on the cost of wiring a cooker. We read, too, that the electric hot water boiler is at present in an undeveloped state, and, owing to high cost, is somewhat of a luxury. It is the opinion of Mr. Forster that the domestic electric load is absolutely bound-up with tariffs. After reading the abstract report of what he had to say to the members of the Birmingham Electric Club, we are inclined to think that the domestic load is bound-up with something more than the charges for energy.

Wiring Inspectors.

Recently we have seen indications among the most conscientious electrical men of the view that electrical wiring should be the subject of fairly frequent inspection, in the endeavour to avoid the faults which give rise to accidents, and which are not serving the best interests of the electricity industry. At a recent meeting of the Scottish Centre of the Institution of Electrical Engineers, a paper was read by Mr. D. S. Munro on "Modern Electrical Wiring as Applied to Small Houses." The author's view can be very generally confirmed, that many corporations have grown lax in making tests or examinations of new wiring installations; and apparently he is inclined to the opinion that now that electricity suppliers and contractors are in competition for wiring work, it is most desirable that a neutral inspecting authority should be instituted. The best safeguard the public has in the meantime is the employment of contractors who are on the national register of the Electrical Contractors' Association; but Mr. Munro has aspirations beyond that. He favours the foundation of a body of trained and certified wiring inspectors, with powers to visit, test, and inspect old as well as new installations. From what we have seen and heard, and with before us the trials and difficulties of consumers, through indifferent wiring, as well as the lamentable results that have arisen from it, we are inclined to think that Mr. Munro is not aiming too high in his ideal of what should be. He has a modest tilt at the isolated insurance surveyors, who are of little service for the purpose of determining the soundness of wiring installations, inasmuch as they belong to individual companies who have rivals willing to take risks. He suggests that the Insurance Offices, the Institution of Electrical Engineers, and the Electrical Contractors' Association, could with advantage, working in combination, found, train, and control an independent body of inspectors. In this way, a higher standard of wiring installation would be promoted. We are pleased to see that so much interest is being taken in this question.

Dangerous Conditions.

It is probably a good thing for new business in electricity that householders do not read some of our electrical contemporaries. We have an example in the contribution of "A Registered Contractor" to the "Electrician." His subject is "Sub-Circuit Switches and Earthing." Things have changed very much since the days when practically every supply was given on the direct-current three-wire system, and domestic electrical equipment was conspicuous by its absence. Then wall plaster was innocuous, and no special trouble was experienced. The old satisfactory situation is now rapidly altering; for metal switch covers and flush switch plates clearly fall within the scope of paragraph 96 of the "Regulations" of the Institution of Electrical Engineers. That paragraph says: "If the conditions are such that a person touching any metal liable to become alive in the event of the insulation being defective is likely to be simultaneously making contact with earth, such metal should be earthed." The solution of the problem appears to lie in the use of switch bases, covers and knobs, or dollies made entirely of insulated material, or alternatively the earthing of the dolly and plate to the conduit box. But there is a danger of chipping and eventual exposure of the metal. "Registered Contractor" has in his own house a large nickel plated warming-plate. The switch has an insulated dolly and cover, and the plate is connected through a two-core flexible to a skirting outlet. A perceptible "bite" is obtainable between the switch dolly and cover, and the metal casing of the warming-plate. The cause of this probably is that either the porcelain or mica insulation has failed, or an element coil has expanded on one pole and the mica of the dolly and blade has failed on the switch. The obvious deduction is that all exposed metal work on the plate should be electrically connected and definitely earthed. He calls attention to other matters. All modern bell systems are operated from the lighting system when this is alternating current. In such a case, to avoid risk of high potential to earth on the bell wiring, one side should be earthed. All metal bell pushes, whether of the wall-fixing or pendant type, are therefore potential sources of danger. He has a fancy metal pendant bell push over the dining-table. Clearly it is an easy matter to lift the electric kettle or the coffee percolator and ring the bell at the same time, thus possibly making contact with earth. In the kitchen, the cooker is fixed alongside the kitchen table, and presents a large surface of earthed metal. An electric iron is used on the kitchen table two or three times a week. What is more probable than that, while using the iron, a saucepan or kettle boils over, and, with the iron in one hand, the kettle or saucepan is moved with the other? He mentions several other pieces of apparatus with metal surfaces, and says that clearly the risk of shock is ever present. Take the chain to the ordinary lavatory flush tank. What is more easy than to seize it with one hand, and to switch the light off with the other? Fixing switches on the neutral lead does not help at all, as the current passed by a cold vacuum or gasfilled lamp filament at a pressure of 220 volts alternating current is much in excess of a fatal dose. In the concluding part of the article, the writer says that all new work in the home must inevitably be carried out on the 230-volt alternating current system. It is useless to blink at the facts, for fatal accidents will rapidly increase unless: (*a*) All covers and dollies of all sub-circuit switches, if of metal, are universally earthed, and switches are designed to stand-up to these conditions, or, alternatively, they are constructed of insulating material throughout. (*b*) The metal work of portable apparatus, including lamp standards, is effectively earthed.

Electrical Combine for Southern England.

A contributed article appeared in the "Evening Standard" on Monday of last week which intimated that negotiations are pending which will eventually lead to the control of the whole of the electric lighting and power undertakings of Southern England, with the exception of London, by one great combine. The statement is made that Sir Philip Dawson, M.P., is a Director of the Company organizing the scheme—the Greater London and Counties Trust, Ltd.; and to him is attributed the declaration that the combine will give a much more efficient and cheaper service for agricultural, industrial, and other uses. American money is to be used, because it can be obtained at a low rate of interest; but the combine is to be entirely under British management. It is proposed to link-up the areas, and to work along the lines of the 1926 Act. In the article there are references to extending the existing "stations," and building new ones. But we should imagine this is a mistake, with the Central Electricity Board as the electricity generators and wholesale purveyors of current in the country. Perhaps we had better wait for developments before saying more.

Scottish Junior Gas Association (Eastern District).—The Association will visit the Cupar Gas-Works on March 17. Members who intend to take part in the golf competition may proceed to the golf course, where they will be met by Mr. A. J. C. Provan, of Messrs. White, Milne, & Co., of Dundee, at any time after 9.15 a.m. The visitors will be the guests of the Cupar Gas Company at tea following the inspection of the works. Afterwards two paperettes will be read: "Modern Governors," by Mr. A. Hounam, of Edinburgh; and "The Use and Economy of a Soot Blower," by Mr. J. Scobie, of Dunfermline.

MAIDSTONE GAS COMPANY'S NEW SHOWROOMS.

New showrooms of the Maidstone Gas Company, which are situated in King Street, on the main London-to-Coast Road, were opened on March 9. The building is a double-fronted one of brick, and has a distinctive and pleasing elevation. "Novocrete" blocks have been employed to carry away the products from the various fires, &c. In the main hall, which is beautifully oak panelled, an excellent display of gas fires in oak settings is to be found on the one side; while on the other side various makes, types, and sizes of cooker are arranged.

Attention must be drawn to the ventilating lamps which are used in the main hall on the ground floor, and in the lecture hall on the first floor. These lamps not only give a soft and well-diffused light, but are so constructed as to act as powerful ventilators discharging all vitiated air from the top of the room outside the building through "Novocrete" flue blocks. In the main hall are many artistic brackets in various finishes, complete with globes and bead and silk shades.

In the hot water section are a large and a small geyser, a "Hollar" boiler, a Clarkhill heater, a wash-boiler, a "Mite" geyser, a "Lyn" boiler, an instantaneous heater, a shaving water bracket, a curling tong bracket, &c.; while there is also in this section a glass test meter which controls the foregoing apparatus, and at the same time is a centre of interest. A bath is installed for demonstrations, and a coke fired boiler is on view.

In the fittings department, which is also on the ground floor, a good selection of pendants, brackets, globes, shades, and switches is shown, while in the centre of the department there is a gas fire stand showing the fire in surround to suit any colour scheme. Beyond this department is the general store.

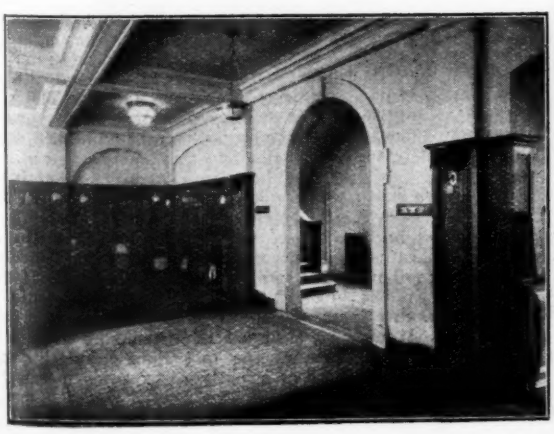
The ground-floor decoration is carried out in yellow in an unusual form of stippling, which is very effective.

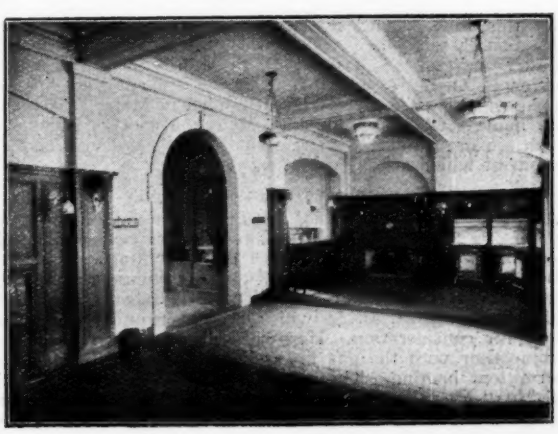
On the first floor is the demonstration room, where it is proposed to hold cookery lectures. This room is fitted with a small platform, and is capable of seating about 120. The decoration is in green, with the same stippling effect as on the ground floor. Most of the lavatory basin fittings in use in the showrooms are of "Crobrite," as are some of the lighting fittings.

The opening ceremony took the form of a luncheon to which the leading men of the town were invited. Among the guests were Mr. C. Valon Bennett, of Rochester, and Mr. C. F. Catt, of Tunbridge Wells, and Major F. Cornelius-Wheeler, the Architect.

After the Loyal Toast had been honoured,

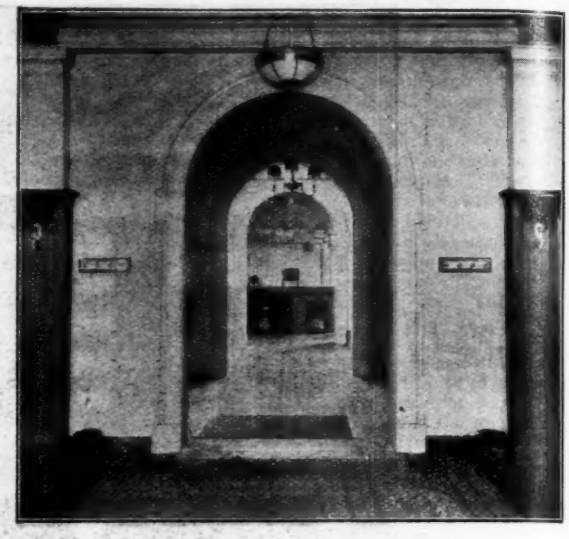
The MAYOR OF MAIDSTONE (Councillor F. R. Connor) proposed "Success to the Gas Company." He remarked that a great deal of the development of the town had followed the formation of the Gas Company, which had contributed materially to the welfare and prosperity of its inhabitants. He paid tribute to the work of Mr. Frank Livesey, the Engineer and General Manager. Mr. Connor said he was convinced that the gas industry was contributing more than ever in its long history to the comfort and convenience of the people in their homes. In the new showrooms they had evidence of the advance and the enterprise of the Company. He congratulated not





only the Directors, but the shareholders on having such attractive premises.

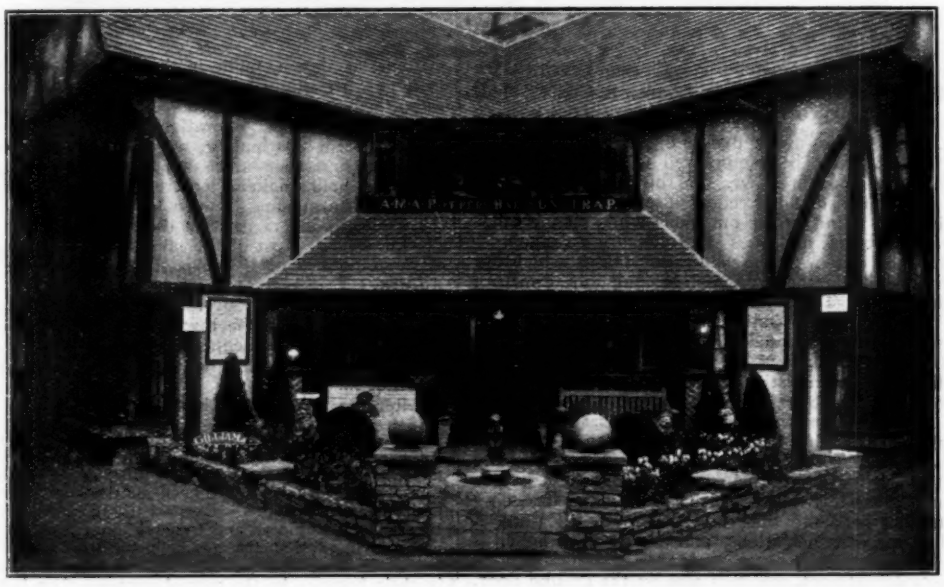
Mr. E. HILLS, responding to the toast, said that the Directors had entire confidence in the general management, capability, and judgment of Mr. Livesey. He (the speaker) was confident that the staff and workers had equal confidence in their Head. They were a happy family; and the good results they attained were due to loyal co-operation. It was the aim of the Company to exhibit some of the latest appliances, so that customers could come to the showrooms and choose the appliances which suited them, get information as to their use, and learn what they would cost. There would also be central offices, where accounts might be paid, and where notice might be given of customers' requirements. They hoped that another purpose would be fulfilled in the use of the lecture room for practical demonstrations. They had there that day gentlemen of the Town Council who decided whether the plans of buildings proposed to be erected conformed with municipal requirements. They had others who designed such buildings, and those who erected them. If, as some said, it was a transgression against the rules of hygiene to construct rooms without flues, would it not be an advantage if some eminent scientific authority could explain to them from that platform that this omission was fatal to good ventilation? A few pounds saved in construction might be at the price of unwholesome air and bad headaches. In these days of servantless houses, it was well for the occupiers to learn how essential gas was in every home, and how much might be done by it in reducing household labour. The old showrooms had become obsolete, and were not suited to modern requirements. Therefore the Directors decided to begin *de novo*, and they asked Major Wheeler, who was an expert on the subject of gas showrooms, to design a building, which had been erected by Messrs. Wallis & Sons. Speaking of the manner in which the Company fulfilled their obligations, Mr. Hills observed that even during the recent flood they were able to supply gas as usual, and during the coal strike in 1926, through careful prevision in maintaining stocks, there was no abatement of supply, no household was restricted of its constant flow of gas for domestic use, and no factory had to suspend its usefulness through shortage of power. If increasing demand was evidence of popularity, and if increasing supply



was a criterion of efficiency, then it was satisfactory that they were able to record a steady increase of supply to their area.

"SUN-TRAP" HOUSE AT OLYMPIA.

FITTED WITH COMPLETE "METRO" GAS AND COKE HOME SERVICE.



[Photo. by Charles Borup, Streatham.

EXTERIOR OF THE "A.M.A." "SUN-TRAP" HOUSE.

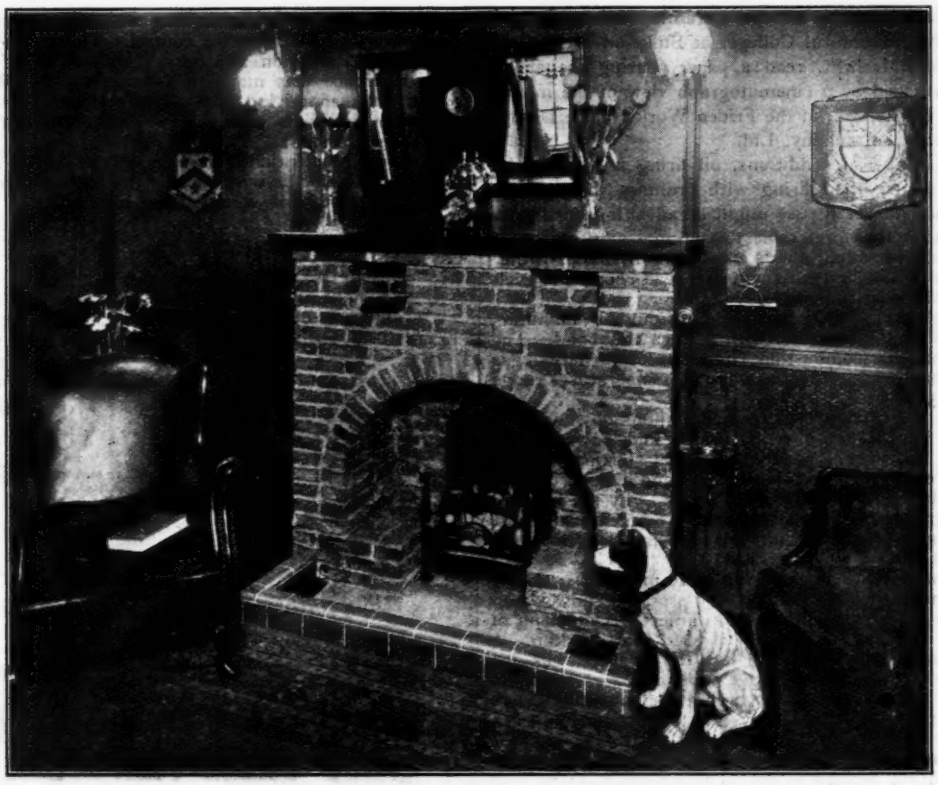
By this time, doubtless, large numbers of readers of the "JOURNAL" will have visited the "A.M.A." Potters Bar "Sun-Trap" House at the "Daily Mail" Ideal Home Exhibition in Olympia, and will recognize the admirable photographs of the building and the complete "Metro" gas and coke home service of the South Metropolitan Gas Company, which we are now able to reproduce. It is a house and an equipment which anyone might envy.

DETAILS OF THE INSTALLATION.

As was explained when dealing fully with the exhibition in last week's "JOURNAL," in the sitting room (where a fire is needed for, say, 12 to 16 hours a day) a "Metro" No. 214 coke grate is installed; it being felt that where a long and steady heating load has to be provided, coke meets the case for middle-class residences, in which cost of running has to be taken into consideration. Here coke need not be regarded as a competitor with the gas fire, which is, of course, ideal for intermittent heating. The sitting room is beautifully illuminated by "Metro" shell brackets. In fact, the casual observer learns a lesson in every room as to how best to apply gas to his needs for lighting purposes, according to his varying requirements. With the exception of the coke fire already referred to, heating is provided by "Metro" gas fires; and the small "Metro-Log" fire is again proving very popular. The kitchen is complete with coke boiler for hot water supply, gas iron, "Metro Clapham" cooker, and gas copper; while last, but not least, there is a gas-operated refrigerator. An alternative system of hot water supply for the summer months, when it would be inconvenient to use the coke boiler, is provided by a Ewart geyser.

Everything in this house, with the exception of the coke-burning apparatus, is shown under actual working conditions.

"Sunbeam Town," in which the "Sun-Trap" House is situated, is in the new Hall Extension, and presents eight houses built, furnished, and equipped as though for permanent occupation. It may be assumed that its name has been bestowed upon it because of the fact that practical domestic application is made here of scientific discoveries in relation to the effect of sunlight on health.



THE DINING ROOM OF THE "SUN-TRAP" HOUSE.

Showing "Metro" Bracket, Burners, and Shades; Small "Metro-Log" Gas Fire; "Metro" Smoker's Companion, comprising Ash-Tray, Wall Bracket, and Pilot-Light; and "Metro" Recessed Wall Tap, with Indicator engraved "Gas On-Off."

THE LOUNGE.

Showing "Metro" Shell Brackets, with "Metro" Daylight Mantles; "Metro" No. 214 Coke Grate; "Metro" Recessed Tap; and "Metro" Smoker's Companion.

PRACTICAL EXPERIENCE OF FIRING REFRACTORY MATERIALS WITH OIL.

At the February Meeting of the Ceramic Society, in the North Staffordshire Technical College, at Stoke-on-Trent, Mr. Frank West, M.I.Mech.E., read a paper bearing the above title. It was preceded by a cinematograph view of the manufacture of silica bricks, &c., at the Friden Works of the Derbyshire Silica Firebrick Company, Ltd.

With normal industrial conditions, oil firing is much more costly in this country than firing with ordinary coal, but in exceptional circumstances its use might be advantageous. Mr. West affirmed that it is preferable to continue working, even at increased cost, providing there are orders in hand, rather than close down and incur permanent overhead charges as well as the dissatisfaction of customers.

At the Friden Works, near Buxton, the Company manufacture refractories from silica sand with a silica clay bond. The products are used for combustion chambers of furnaces, gas retorts, coke ovens, &c., where the working temperatures range from 1200° to 1500° C.

Two types of kiln are in use, semi-continuous downdraught kilns (built in benches of 6 to 17 kilns) and downdraught beehive kilns. The former include the usual starting kiln, in which it is necessary to start from cold, and the succeeding kilns are partially heated up (to about 800° C.) by the forward heat from the preceding kiln before firing commences. These kilns (other than the starting kiln) are fired from the top, and induced draught is used on most kilns.

The first attempts with liquid firing were made in 1919, the results being unsatisfactory, though they provided some useful data for future work. Liquid tar was injected by means of steam injectors fixed at each end of a 30-ft. starting kiln. A very intense flame was produced, but the heating was too rapid, and all the ware was cracked. Oil also was tried—on the boilers—but proved very costly, and other substitutes were also tried. A mixture of coke breeze and tar, used in the same way as coal, proved effective, and cheaper than coal until the increased demand for tar made the cost prohibitive.

In 1926 Mr. West decided to try oil firing again, using coal only for the starting kiln, and oil for the others. This method proved very satisfactory; and large quantities of bricks and blocks were burnt in that way. Oil was forced through very fine sprays or jets into the kiln; the sprays being different from the type of burner previously used. At first two sprays were fixed to each kiln (one at each end), which system was effective. But the sprays were troublesome to keep clean, and deposits of carbon were formed. The sprays were afterwards fixed through the coal-firing holes on the top of the kiln—an arrangement which proved very satisfactory. The oil before use was passed through fine silk screens, and then heated up.

Further experiments were carried out since the coal dispute ended, mainly to get over the difficulties of the starting kilns heating up from cold, in order that oil firing might be turned on any time when necessary without serious delay. From the results of these recent experiments, they would in future, for all the kilns after the starting kiln, place one burner of a third type at each end of the kiln, and accelerate with the second type of burner as the temperature rises. The third type was a burner of the Incandescent Heat Company, borrowed from a Hanley firm.

Oil Firing of Beehive Kilns.

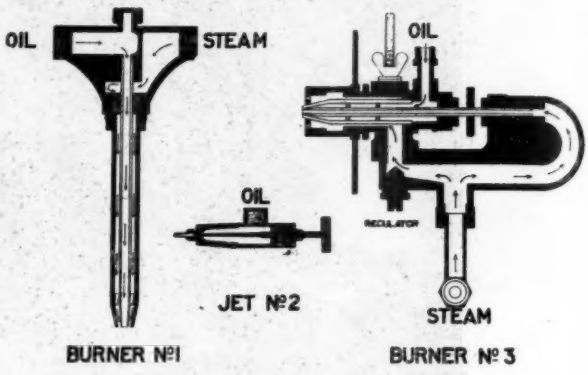
These were 22½ ft. in diameter, and 12 ft. high inside, and had eleven furnaces. The firemouths were built in, leaving only small spaces—which could be regulated—for the ingress of air. A burner of the third type was placed in each furnace. The bags inside were made as for coal firing at first, but for the second and later firings an annular space was made to surround the actual setting, forming the combustion chamber. The setting of the ware was also altered so as to give more efficient circulation. The size of the steam pipes was increased to maintain a pressure of at least 30 lbs. The oil consumption was 15½ tons for the first firing, and 11·69 tons for the second firing.

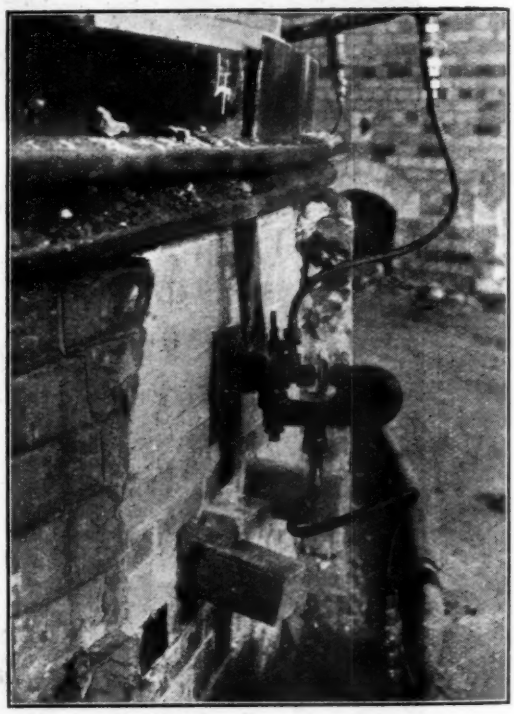
In the second burn, three burners placed at equal distances were used for 26 hours, and then another burner was put on. Between the 38th and 46th hours, five burners were working, and, thence to the finish, seven burners were used. Comparative results of coal and oil firing are given in Tables A and B.

Oil Firing in Semi-Continuous Kilns.

A burner of the third type was placed in each of the four furnaces of a starting kiln, with an additional burner at each end of the kiln. A combustion chamber 18 in. wide was made, bounded by the kiln wall and bags. In the middle of the chamber a dividing wall was built so that the flame would be deflected on to the setting. The two end burners were started, and maintained in operation for 45 hours, and then these burners were moved to the two end firemouths until the finish of the burn. The total fuel consumption was 3·7 tons. Comparative results (oil and coal) are given in Tables A and B. This arrangement of the burning was highly satisfactory, and the burners proved easy to control. The goods were always in excellent condition and very clean-looking after oil firing. Brief reference was made to a paper by Mr. West and Mr. Fagan, in 1926, giving particulars concerning the burning of refractory materials with coal. Some of these figures appear in Tables A and B.

It should be mentioned that the cost of labour with oil firing is about the same as with coal on the proportion of kilns under survey. Probably it would show in favour of oil if all the kilns were oil fired. No comparative details can be given regarding wear and tear, but the appearance of the kilns suggests the probability that oil firing would show up better than coal in this respect.





One of the Burners Working in a Beehive Kiln.

The extra cost of steam for oil burners has not been reckoned, but it would certainly neutralize some of the advantages.

The results show that on the semi-continuous kilns, when burning to an average temperature of 1500° C., 644 lbs. of crude oil is equivalent to 1093 lbs. of good coal per 1000 squares (3 in. equivalents), which means that oil (at 85s.) is equivalent to coal at £2 10s. 5d. per ton, with the labour and other conditions about the same.

It may be stated in conclusion that the results obtained have shown that oil may be used successfully for firing when coal is either too costly or too difficult to obtain, and at the Friden Works it will certainly act as a stand-by if such conditions should arise.

It should be understood that for comparison the results given are taken up to the desired temperature, but fuel used for soaking is left out, as it varies according to the requirements of the materials.

Analyses of the coal and oil used are as follows:

COAL.

	1st. P.Ct.		2nd. P.Ct.
Proximate analysis—			
Moisture	5·55	..	6·16
Volatiles	34·61	..	33·83
Fixed carbon	52 89	..	54·23
Ash	6·95	..	5 78
Ultimate analysis—			
Carbon	74·38	..	75·57
Hydrogen	4·85	..	4·77
Sulphur	3·05	..	2·45
Nitrogen	0·92	..	1·08
Ash	7·36	..	6·16
Oxygen (by difference)	9·44	..	9·97
Calorific value (determined), B.Th.U. per lb.	13,700	..	13,700

OIL.—ANGLO-PERSIAN FUEL.

Approximate specification—	
Specific gravity at 60° Fahr.	895 to 900
Flash-point, not less than	150° Fahr.
Viscosity (Redwood)—	
At 100° Fahr., not more than	100 secs.
" 70° " " " "	300 "
	P.Ct.
Sulphur	1·5
Hard asphalt	1·8
Ash	0·02
Water and sediment	0·75
Chemical analysis—	
Carbon	85·00
Hydrogen	10·9
Oxygen (by difference), (sic.)	0·1
Calorific value, B.Th.U. per lb.	19,400

All work is expressed in the number of equivalent 9 in. by 4½ in. by 3 in. bricks. The comparative results are given on the same type of kilns at similar temperatures, the average temperature to which the goods are burnt being 1500° C.

Several references to statements in recent publications are added. The full paper will appear in the Transactions of the Ceramic Society, with illustrations of the three types of burner, &c.

TABLE A.—*Results of Burning Silica Goods in Different Types of Kilns with Coal and Oil at the Friden Works of the Derbyshire Silica Firebrick Company, Ltd.*

Description of Kiln.	Total Capacity 3 in. Equivalents.	Coal. Weight of Coal Used per 1000 3 in. Equivalents.	Oil. Weight of Oil Used per 1000 3 in. Equivalents.	Grog and Wasters.
		C. q. lb.	C. q. lb.	P.Ct.
Series of six semi-continuous kilns	36,050	9 3 1 (1093 lbs.)	..	7·5
		3 3 23	3 3 8 (428 lbs.)	6·0
			5 3 0 (644 lbs.)	5·6
Beehives	25,760	16 0 22 (1814 lbs.)	..	3·8
			9 0 9 (1017 lbs.)	2·25

TABLE B.—*Cost of Fuel per* 1000 *Squares* (3 *in. Equivalents*).

Description of Kiln.	Total Weight of Fuel.	Rate.	Total Cost.	Cost per 1000 3 in. Equivalents.
	T. c. q. lb.	s.	£ s. d.	£ s. d.
Series of six semi-continuous kilns	17 12 0 0	25	22 0 0	0 12 2
Coal	7 2 2 0	25	8 18 1	1 1 3
Oil	6 17 2 0	85	29 4 5	
	10 8 0 0	85	44 4 0	1 4 6
Beehives	20 17 0 0	25	26 1 3	1 0 3
	11 14 0 0	85	49 14 6	1 18 7

LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.

Annual Dinner and Concert.

The Twenty-Sixth Annual Dinner and Concert of the Association, which took place at the Criterion Restaurant, W. 1, on March 2, was a conspicuous success; and all concerned in its organization are to be congratulated. The toast list was commendably short, the entertainment was more than usually bright and cheerful, and the entire evening proved one of sustained social enjoyment.

After the Loyal Toast had been honoured,

EARLY DAYS OF THE ASSOCIATION.

Mr. H. D. MADDEN, the President of the Institution of Gas Engineers, rose to propose the toast of "The London and Southern District Junior Gas Association." Nowadays, he observed, the term "junior" was, perhaps, hardly apt, for the seniors in the gas industry did not look upon the "juniors" in the sense which the word itself implied. They realized that it was only a question of relative position. It was many years since he had the pleasure of meeting the Association. He had noticed that in the reports of their dinner last year, when they celebrated their twenty-fifth anniversary, it was stated that he was responsible for seconding the proposal for the formation of the Association; and though he did not recollect this clearly, he well remembered the first meeting, when there were fourteen present. He had been away from London for 21½ years, and he would like to remind those present of the time when the Association came into being. A Junior Association had been commenced in Manchester; and they felt that a similar Association should be started in London. As a matter of fact, the notion germinated when four or five of them, including Mr. Walter Grafton and Mr. J. M. Campbell, were walking through St. Paul's Churchyard. And, remarked Mr. Madden, he would like to say how much the Association, and the gas industry generally, owed to Mr. Grafton. At that time he was holding classes at the Polytechnic; and it was he who first saw the great necessity for further education in the gas industry. The Association, continued Mr. Madden, had developed in a remarkable manner; and to-day its membership was over 350 strong. He was glad to note that the Association had amended its rules to admit to membership by examination. This, he thought, was a wise decision.

SERVICE AND EDUCATION.

The object of the Association was to afford help in technical matters connected with the gas industry. As an industry they were out to give service; and good service could be rendered only by a knowledge of cognate sciences as well as the technique of actual gas supply itself. The ranks of the gas industry had been threatened by a misinformed public; but those undertakings possessed of well-educated staffs felt no panic about this. He might tell them that so great was the belief of one city in the wonders of electricity, that the particular city was divided into fourteen districts. The idea was to canvass every house in each area, and sweep away gas. However, such was the nature of the service given by the gas undertaking, which was staffed by men who really knew their job, and gave satisfaction to the consumer, that the electric scheme was abandoned at the end of a week's trial. The Electricity Scheme of the Government, he thought, would not do the gas industry damage. The cost of current had not been cheapened. All the new developments demanded a great deal of capital, and the cost must find its way back to the consumer. On the question of service, Mr. Madden urged those present to give as much service to the small prepayment consumer as they gave to the large industrial customer. The London and Southern District Junior Gas Association had an influence on the Junior Associations throughout the country. The example of the London Juniors had been followed in Wales by the Wales and Monmouthshire Junior Gas Association, and more recently by the Western Junior Gas Association. He would say further that the Juniors had had a big influence on the Senior Associations and on the Institution of Gas Engineers itself. The Education Scheme was largely the result of the work of the Juniors. Regarding education in the industry, he had noted with satisfaction that during the five years the Scheme had been in operation, there had been a marked improvement in the standard of the examination papers. The new student was a keener man, and one who took an interest in cognate subjects. At present the Institution were considering a revision of their rules; and this was due largely to the forward movement of the Junior Associations. The Institution were hoping to be granted a Royal Charter. This must benefit the Juniors, and give them greater incentive to qualify for membership of the parent body.

RESEARCH.

There was another aspect of the question, and that concerned investigation and research. Those who followed the technical journals would be aware of the large number of Research Committees of the Institution who were investigating various problems of gas manufacture and utilization. In his address at the annual general meeting of the South Metropolitan Gas Company, Dr. Charles Carpenter had mentioned the work of the gas industry in connection with the medical treatment of children's complaints. The Institution were collaborating with Sir Henry Gauvain in this work; and it was hoped that, as a result, curative treatment of this particular type would be greatly improved. The gas fire of the future, said Mr. Madden, might be different from that of to-day, and might perhaps be composed of materials of medical value. What he had mentioned indicated that the future of the gas industry rested on research; and in this matter the pillars of the Senior Associations were the Junior Associations. Much work remained to be done, as was demonstrated by Mr. Thomas Hardie in a recent address to the Western Junior Gas Association. Mr. Hardie had stated that the quantity of gas consumed *per capita* in American cities was greater, on an average,

by 2000 c.ft. per annum than the corresponding figure for this country. This fact, coupled with the knowledge that America was the great electric country, showed what a broad field lay in front of them in England.

Thanks to the Seniors.

Mr. Leonard Lacey, President of the Association, replying to the toast, said how excellent it was to realize that one of their past members was the President of the Institution of Gas Engineers. On behalf of the Association, he congratulated Mr. Madden, and at the same time thanked him for his presence with them that evening. He had always taken a great interest in the education and welfare of the Juniors; and the success of the Wales and Monmouthshire Junior Gas Association was largely due to his enthusiastic help and support. It was, said Mr. Lacey, gratifying to learn that Mr. Madden considered that the London and Southern District Junior Gas Association, in making examination one of the rules of membership, had taken a step in the right direction. Mr. Lacey said he would like to take the opportunity of expressing the thanks of the Council of the Association to Mr. Arthur Tennant, the Hon. Secretary. He (the speaker) had held the office of Secretary as well as that of President; and he would leave it to the members to decide which entailed the more onerous work. He also thanked the managements of the gas undertakings in and around London for their great help and kindly encouragement.

Encouragement and Support.

Mr. S. B. Chandler, of the Tottenham District Light, Heat, and Power Company, proposed the toast of "The Visitors." He remarked that the London and Southern District Junior Gas Association were most fortunate in having the friendship and support of practically the whole of the seniors in the gas profession—encouragement which had done much to create and maintain the position of the Association; and without which it would be impossible for the Association to occupy its present place in the sun. They congratulated themselves that the seniors gave them their confidence. They owed a debt of gratitude to the seniors for their courtesy and kindness in arranging for visits of inspection, which were most necessary from the educational viewpoint. In referring to the Education Scheme, Mr. Madden had paid the Juniors a great compliment; but he (the speaker) would observe that the Scheme could never have taken its place without the support of the Institution of Gas Engineers. For this support, he expressed the thanks of the Association. Mr. Chandler went on to say that they were very fortunate in having with them many distinguished visitors. Besides Mr. Madden, who occupied the position of highest honour in the profession, and who had done so much to promote the Education Scheme, there were present Mr. J. Terrace, Chief Engineer of the South Suburban Gas Company, to whom the Junior Associations owed their thanks; Mr. Stuart Kerr, the Principal of the Westminster Technical Institute, who was well known to all the junior members of the profession in and around London; Mr. C. Valon Bennett, of Rochester; Mr. J. S. Thorman, of the Gas Light and Coke Company, who was one of the examiners under the Education Scheme; and Mr. R. W. Foot, the Assistant General Manager of the Gas Light and Coke Company, whom he would ask to reply to the toast. The Gas Light and Coke Company were the pioneers of technical education in the gas industry; and the excellent scheme of apprenticeship, with which Mr. Foot was intimately concerned, was doing highly useful work.

Maintaining Efficiency.

Mr. R. W. Foot, Assistant General Manager of the Gas Light and Coke Company, replying on behalf of the visitors, said that this was the first opportunity he had had of meeting the Association all together, though he knew many of the individual members, and had had the privilege of arranging many of the visits of the Association to the works of the Gas Light and Coke Company. He might say that the Company would never receive a request from the Association, to visit their plant, with anything but the greatest pleasure. The Association was one for which he had great respect, and to which they in the Gas Light and Coke Company attached much importance. The gas industry to-day had reached a higher state of efficiency than ever before; and they looked to the Juniors to maintain this high standard. Competition from electricity and other fuels was not of the type which was here to-day and gone to-morrow. It was permanent, and might increase in severity; and it could be met successfully only by their maintaining a really high standard of efficiency in their own industry.

WESTERN JUNIOR GAS ASSOCIATION.

A Meeting of the Association was held in the Showrooms of the Bath Gas Company on March 3—Mr. Arthur Marsden, the President, in the chair.

The Chairman welcomed Mr. J. Wesley Whimster, the Engineer and Manager of the Bath Gas Company, as Hon. Member of the Association.

DISTRIBUTION.

By W. M. Paterson, Distribution Superintendent to the Bath Gas Company.

No consumer will be thoroughly satisfied—from our point of view—until we have inspected his premises, and overhauled and modernized all pipes, fittings, and appliances.

This subject suggested itself to me after I had seen the results of special reports which have been made of conditions in a number of Bath houses. These inspections were first made in cases where we were receiving chronic complaints. It was realized that, in response to a complaint, it was futile to send a fitter to make what would probably be merely a temporary improvement; and our inspectors therefore followed up the fitters, and made a thorough examination.

Our experience soon proved that it is absolutely essential for all complaints to be dealt with in this way; and it is very much easier to get consumers to agree to modernize their installations when they have had dissatisfaction. A report is made out which forms a permanent record for each house.

Mains.

In 1919, the first clear year after the war, the annual output of gas was 820 million c.ft. through 132 miles of mains to 18,720 consumers; while the corresponding figures for 1927 were 1191 million c.ft., 156 miles, and 21,388 consumers—an increase of 45 p.ct., 18 p.ct., and 14 p.ct. respectively.

You will notice that the output has increased to a much greater extent than either the miles of mains or the number of consumers. The increased output per mile of main has been met by laying several low-pressure feeder mains, by the greater use of high-pressure mains feeding through governors, and particularly by increasing the pressures at the outlet of the station governors at times of peak load.

The point has now been reached when mains must be increased and pressures reduced, and the standard which it is desired to achieve is that 6-in. pressure at works must give 4-in. pressure at the extremity of the district at the period of highest consumption. At present we are able to maintain a minimum pressure of 3 in. at all parts of the district at all times, but at maximum load it is necessary to have 9 in. at the outlet of the station governors. This question of variation in pressures in mains has an important bearing on the size of internal piping, to which I will refer later.

For some time past we have taken pressures between 12 and 1 o'clock on Sundays at pre-arranged points. These pressures are taken in houses with all gas turned off for a few moments, and the results are then marked on a map of the city. This has given us a great amount of valuable information regarding the conditions in all districts, and the unsatisfactory localities will be dealt with during the summer. Each winter the same procedure will be followed, until the standard mentioned has been attained.

The sharp variations in elevation in and around Bath will necessitate the installation of more district governors; and in this connection I might mention we have nine high-pressure governors, two of which are in pits, and the other seven in small chambers above ground. Our experience of underground fixing has led us to avoid it at all costs, and we now obtain permission from the owner of a convenient site to erect a small house, for which we pay an annual easement of 1s., on condition that we remove the erection on receiving six months' notice. We have not yet been called on to do this.

Services.

We rarely find any ½-in. services in Bath, but there are many ¾-in. services, a considerable number of which are in fair condition; and in the case of those supplying a cooker and lights only (mostly slot installations), they are adequate for the consumption required. Of 1-in. services there is a large number, most of which are of sufficient size if properly clear. All larger services are of fairly recent date, either new or relaid, and are in good condition and of ample size.

Since 1920, about 4000 services have been relaid, the sizes generally being 1-in. pipe for slot installations, and 1¼-in. to supply a quarterly meter. These sizes also apply to new services.

Although a ¾-in. service would no doubt supply a slot installation, the additional expense of a 1-in. pipe is only the difference in the cost of the tube; the labour costs being more or less equal. This also applies to 1¼-in. services, where 1-in. might probably be large enough. However, the possibility of future tenants using more appliances must be considered, particularly with ordinary consumers.

A record on cards has been kept since 1915 of all service complaints from every house in the area, and all cases experiencing chronic trouble are thoroughly investigated before it is decided to relay the service. It is always necessary to ascertain the maximum quantity which a service will be called upon to pass, and compare this with the quantity which a new pipe of similar length and size is capable of passing with a reasonable fall in pressure.

Some time ago we carried out a test on new piping, with the following results:

Length of Pipe in Feet.	C.Ft. Passed with Absorption of 5 Tenths Pressure.		
	¾ In. Pipe.	1 In. Pipe.	1¼ In. Pipe.
20	123	300	580
40	109	251	450
60	82	200	400
80	772	156	327
100	60	·134	277

These figures show the quantity passed by various lengths with the difference of 5 tenths between the initial and final pressures, which we consider is the maximum permissible absorption in the service. There were several bends in each length, and these were taken to be equivalent to a certain amount of unavoidable encrustation of the interior of services which have been in use for some years. If the results are plotted graphically, the quantity which should be passed by any length from 10 to 100 ft. can be easily read off.

It will be noticed that the quantities passed by any given length are in the rough proportion of 1 :2 :4 for the sizes ¾ in., 1 in., and 1¼ in.

If a service, on inspection, is passing the quantity corresponding to the standard, but is absorbing considerably more than 5 tenths pressure, it is opened and rodded; but where it is found that the quantity passing is over the standard amount, it is obvious that the service is too small, and it is therefore relaid.

Before leaving services, I might mention that where the pipe falls from the main to the meter, we fix a cast-iron syphon, which holds about half-a-gallon of water, and which we have cast at a local foundry. It was found that the old **U**-tube type of syphon made of bent tubing was of insufficient capacity, and could never be properly pumped dry.

METERS.

In dealing with meters, the only point with which I am concerned just now is the obstruction, when overloaded, that they offer to the flow of gas. How are we to determine the capacity of a meter to be fixed, in relation to the appliances which it will have to supply? On our inspection sheets appears the item, "Quantity of gas passing meter—all appliances on," but it does not follow that we are obliged to instal a meter of rated capacity equal to this maximum load. Apart from the expense of this, the space in which the meter is fixed is in many cases too small for any larger size.

The problem is to determine how often the meter will be called upon to pass maximum consumption; and this is indicated to some extent by the relation between the total annual consumption and the maximum hourly consumption with all appliances on.

We have found cases where the meters, with all appliances in use, were considerably overloaded, and yet the annual consumptions were low, as compared with other cases where the meters, with a reasonable maximum consumption, were giving much higher annual consumptions.

We must not forget, however, that an overloaded meter, apart from slow registration, is a source of trouble to the consumer. The maximum load may be intermittent, in which case the meter itself will not come to any harm, but it will throw excessive pressure, and the appliances will not function efficiently. Forgetful of weeks of good supply for his ordinary needs, the consumer, for a few hours, has not been able to obtain what he wanted, and he becomes the dissatisfied consumer which we wish to avoid.

INTERNAL PIPING.

This I consider to be the greatest problem of all, as it is the consumer's private concern, and he has to be convinced that the unsatisfactory supply is due to inadequate internal piping.

In the route taken by the gas from the main to the point of combustion, there are three sections in which pressure is absorbed: (1) The service, (2) the meter, and (3) the internal piping. It is possible to have one of these sections absorbing a considerable amount of pressure and still passing sufficient gas for ordinary requirements without affecting the appliances in use. If, however, the demand increases to maximum, the appliances are at once affected, owing to the absorption of pressure prior to the point of combustion.

If either the service or the meter is at fault, the consumer is justified in complaining; but if it should be the internal piping, we must prove this to the consumer, and persuade him to have it put right.

Let us assume that the service and meter, being our responsibilities, are correct, and the internal piping is inadequate. With 6 in. pressure in the mains, ordinary requirements can be supplied, even with small internal piping, but if, as might happen on Sunday mornings, the main pressure falls to 3 in., the consumer will at once notice the difference; and if cold weather accompanies the Sunday cooking load, thereby increasing the demand to maximum, there will be insufficient pressure at the point of combustion. Here again we have a dissatisfied consumer; but in this case no blame can be attached to us.

We are often told that "the gas is all right except on Sundays." Our reply is that the pressure, though variable, never falls below what is sufficient to supply all requirements, if the internal piping is correct; and if we can prove with a pressure gauge on the meter outlet that this is so, we are able to make a strong appeal to the consumer to do his part.

This, however, applies only to existing houses. In a recent Board of Trade Order, we had a clause inserted, and accepted, which gives us the right to refuse to supply gas to a house unless the internal piping has been installed to our specification. No definite arrangements have yet been made to bring this clause into operation; but when the time comes, we shall have another strong argument for consumers who neglect to have their internal piping overhauled.

In cases where the consumer is resolved to have nothing done, we have adopted a procedure which, I think, ought to be very successful. If appliances are adjusted at a pressure of (say) 5 in., it is obvious that they will be much affected if the pressure falls to 3 in. If, however, they can be adjusted at this latter pressure, at ordinary times they will pass too much gas, but at times of maximum load and lower pressure they will give a good efficiency.

In such cases, therefore, all appliances are lighted, the pressure at the meter outlet is set at 3 in. by means of the main cock, and the appliances are readjusted to suit these conditions. The main cock is, of course, left full open after the readjustments have been made.

At most times the appliances will have too much gas passing through them; and unless they are regulated at the supply tap we may have a complaint of high consumption. We shall then have an excellent opportunity of reading a lecture to the consumer, and I have no doubt that it will be an effective argument in favour of large internal supplies.

APPLIANCES.

As a contrast to the difficulties visualized in connection with meters and internal piping, I am glad to say that we are in a good position as regards appliances. At the end of the war, it was decided to concentrate on sale or hire-purchase of all types of appliances, and to discourage simple hire, if not to stop it altogether. This policy has proved most successful.

Simple hire was justifiable in the early days when cooking and heating by gas were innovations and the general public were not inclined to lay out money on an article that might not be a success. Gas cookers and fires are now firmly established in the public regard; but simple hire, once started, is not easily stopped. A splendid opportunity, however, was presented at the end of the war, when gas undertakings were setting their house in order after war-time restrictions, and there commenced the tremendous increase in domestic owner-occupiers, which opened up a market for privately-owned appliances.

The appliances of the present day have reached such a high stage of efficiency as compared with pre-war types that, though designs may change, I cannot see the possibility of any vital alteration in the principles involved in their construction. We can therefore assure purchasers that the appliances will not become obsolete during their useful lives.

We have not found it difficult to convince would-be hirers that it is to their advantage to purchase or hire-purchase; but in the case of those who will not do so, we let them have a hired cooker which has been returned by someone who has purchased one. It is a better defence against competition to sell a cooker or fire than to provide an easy means of obtaining it (and, of course, discarding it) by way of simple hire. The average consumer cannot afford to scrap, even if he wished to, a cooker which has cost him perhaps £15; but it is a very easy matter to terminate a simple hire agreement.

On the score of maintenance, it has been argued that with simple hire the undertaking has the advantage of the right of access to the appliances; the cost of upkeep being included in the hire charges. I doubt that this is a great advantage. The development of free maintenance of privately owned appliances is appreciated by the consumers, and gives us a psychological advantage more to be prized than right of access.

These being the reasons why simple hire is discouraged, I wish to give proofs of the success of our policy. Since 1919, the number of cookers hired by ordinary consumers has been reduced from 5215 to 4086—a decrease of 1129. In the same period, the ordinary consumers have increased by 2213, while we have sold for cash or hire-purchase 3898 cookers. You will therefore see that, though we have withdrawn 1129 cookers from simple hire, these have all been replaced. All our new consumers have been supplied with a cooker, and there still remain 556 cookers which have been fixed in Bath.

As regards hired fires, there has been a decrease since 1919 of 242, but the number sold amounts to 9534. It is possible that, had we continued simple hire, there might have been a still greater number on the district, but it is doubtful if they would have been used to such an extent. I am sure there are many undertakings who hire fires on the easiest possible conditions, but who cannot justify this policy by increased outputs.

In connection with mains, I mentioned that, while the output had increased by 45 p.ct. since 1919, the consumers had increased by only 14 p.ct. That this is due to a great extent to

the use of gas fires is shown by the fact that a decrease in temperature at once increases the output. So much so that in December last, during the spell of frost, the daily output rose in one week from 5·2 millions to 6·1 millions, the latter amount being an increase of 13 p.ct. over the previous record daily output.

The disposal of hired cookers and fires brought in from the district has presented no great difficulty. Cookers worth repairing are fitted with a modern hotplate, and are used to replace very old patterns, which are scrapped. An outlet is also found for surplus cookers by using them in slot installations.

As regards fires, a few years ago we recalled and scrapped all old-pattern hired fires, and in their place fitted newer types which had been brought in. This absorbed a great many of the surplus stock, while we give slot consumers of over 40,000 c.ft. the benefit of a fire free of hire charges. They pay, however, for fixing, at the rate of 6d. per ft. run of piping required.

In addition to our own activities, we encourage local gas-fitters and plumbers, by allowing them trade discount, to bring their customers to our showrooms to inspect our stock, thereby ensuring that only first-class appliances are being installed.

For some years, therefore, a definite policy has been observed whereby the ownership of cookers and fires is passing from the Company to the consumer; and slowly but surely obsolete types are being scrapped, and modern types fixed.

WATER HEATERS.

As regards the other principal type of gas appliance, I wish to mention only two points. In the first place, we refuse to fix geysers without the recognized flue, baffler, and cowl; but unfortunately there are local firms, who have no scruples on this point. Legislation may be called upon to enforce the provision of means for adequate ventilation; but are we in a position to say that the means at our disposal enable us to fix a geyser in such a way that in no circumstance will any products of combustion find their way from the flue and its fittings back into the bathroom? I think this is a matter for careful research.

The second point is that all gas circulators and coke boilers sold by us are visited every three or four months for thorough cleaning of the water way. This is necessary because of the hardness of Bath water, and we have no difficulty in persuading the purchasers to have their names added to our list.

LIGHTING.

On this subject I can only say that, though we recognize the impossibility of retaining all the lighting load, it is not because gas for lighting is a dead-letter. Though we have sustained losses, we have, on the other hand, been allowed to modernize the lighting of a number of churches and schools, with very satisfactory results. This proves, if the general public would but see it, that modern gas lighting has no equal.

One complaint I must make, however, and that is about the excessive cost of multiple burner lamps and automatic control fittings. This high cost is a very serious handicap to our efforts to retain the lighting load.

Discussion.

Mr. WHIMSTER said that the paper had shown that it was little use starting to maintain apparatus unless a satisfactory supply of gas was maintained. In debarring hired apparatus, they found this did not deter gas consumption. The consumption *per capita* at Bath was 15,000 c.ft. It had been found that apparatus actually purchased by a consumer was cared for, while hired apparatus did not receive this care and attention. He would like to see a governor in every home, provided a reliable, efficient, and cheap type could be purchased. At the present time, a local firm, under their supervision, were concentrating on a light and cheap governor, priced at about 15s., instead of the existing high cost of £3 to £4. They had a system of general maintenance for about 3000 consumers. When a consumer sent in a complaint, he was approached with regard to his inclusion in this scheme. The idea was to have all consumers on this list.

The PRESIDENT asked what material was used for the services in Bath. As Bath was chiefly a residential town, it would appear that the difficult problem would be the internal fittings of the older houses. Was mercury utilized in the governors being constructed? If so, this would add to their cost. Mercury cost about 8s. 6d. a pound.

Mr. J. CONWAY (Bristol) asked what were the minimum size of meter let out on hire and the minimum service for a private house, whether free maintenance was granted to all consumers, and whether a full-way main cock was fixed.

Mr. ARMITAGE (Cheltenham) inquired whether they had modernized all the slot consumers' apparatus in Bath. With faulty internal fittings, were concessions made to overcome this trouble? At the British Industries Fair, at Birmingham, there seemed to be a large variation in the different types of apparatus. Did not this point to a variation in the future types?

Mr. HOLE (Bath) agreed with the latter remark of Mr. Armitage, and stated that Radiation, Ltd., were concentrating, at a large cost, on a new type of gas fire.

Mr. PATERSON, in reply, said that the services in Bath were of wrought iron. About 1 lb. of mercury would be used for each governor. Five-light meters were being fixed, and the gradual working out of the 3-light type was taking place. Some of the latter were being converted to the 5-light capacity. A 1-in. service was the minimum now put in. The free maintenance scheme was extended to all. All main cocks were full-way. In the case of slot consumers, the modernizing of apparatus was being carried out. New hotplates were fixed to cookers. A monetary concession was made as an inducement to consumers to have faulty internal fittings remedied. He was of opinion that no radical change would take place in the different types of appliances.

A vote of thanks to Mr. Paterson for his paper was proposed by Mr. BARRETT (Frome) and carried with acclamation.

GAS-WORKS EFFLUENT.

By W. P. SMITH, B.Sc., of Bolton.

[Before the Manchester and the Yorkshire Junior Gas Associations, Feb. 22.]

Gas liquor contains no putrefying organic matter, but it does contain bodies capable of oxygen absorption. The chief offenders from this point of view are:

(1) Phenolic bodies, including phenol itself, and higher tar acids or colour-producing bodies; among these latter we have cresols, cresylic acids, amines, &c.
(2) Ammonium thiocyanate.
(3) Ammonium thiosulphate.
(4) Ammonium sulphate, sulphite, sulphide, cyanide, chloride, &c.

The amount of oxygen required completely to oxidize a sample of liquor is a measure of the pollution of that liquor, or the work which has to be done in purifying it before it becomes innocuous. It is usually expressed as parts of oxygen by weight per 100,000 parts of liquid, and designated the O/A figure.

There is a direct absorption of phenolic bodies by liquor in contact with tar. A liquor with an original O/A figure of 500 is increased to 850 after four weeks in contact with tar. From this it will be seen that, as far as practicable, the tar and liquor should be separated before they get to the storage wells, and kept separate.

Slow cooling in atmospheric condensers, giving long time contact of the tar and liquor, is ideal for the absorption of phenolic bodies. It is at the hot end of the system that the greater absorption of phenolic bodies occurs.

When horizontal retorts were the principal form of carbonizing plant, slow cooling was advocated by many gas engineers, in an attempt to safeguard the lighter hydrocarbons. The effect of shock cooling, while bringing down naphthalene, also brought light hydrocarbons down with it. It has been shown that the best method of dealing with naphthalene is to instal a naphthalene washer. Again, with a gas of lower calorific value, and usually about 2 p.ct. of unsaturated hydrocarbons as against 6 to 7 p.ct. previously obtained, the danger of shock cooling is considerably minimized. Thus it is now possible to consider some rapid system of elimination of tar from the gas, out of contact with liquor as far as possible. It has been stated that if this can be done, the phenolic content of the liquor is considerably reduced. Unfortunately accurate figures are not available.

Even small quantities of tar with long time contact will give contamination of the liquor by phenolic bodies. Thus the small quantity passing a Livesey washer has produced contamination in the liquor leaving the scrubber. The contamination in a rotary scrubber will be much less than that in a tower scrubber, due to the much lessened time contact in the former.

The following are a few of the suggestions which have been put forward to reduce this phenolic contamination.

(1) Replace the atmospheric condensers with water condensers where financially practicable. This, however, only reduces the time contact and is a relief rather than a cure.
(2) Remove the tar before the liquor has time to condense—that is, remove the tar at a temperature above the dew-point of the gas. In coke oven works the "Cyclone" tar extractor is used for the removal of the tar from the hot gas prior to its passing into the saturator box of the semi-direct or direct ammonia recovery plant. To obtain more complete removal of the tar than is effected by the "Cyclone" method, the fixed ammonia spray has been used in coke oven practice. Laboratory experiments have shown that the free ammonium salts in ammoniacal liquor favour the emulsification of the tar, and the extraction of oxygen-absorbing constituents, when tar and liquor are shaken together, while fixed ammonium salts have a contrary effect. In this process the hot gas leaving the carbonizing plant is sprayed with a

fixed ammonia solution. The resultant tar and spray liquor are run off from the spray chamber, and separated; the liquor being pumped back to the spray. When the liquor is sufficiently strong, it is treated for the fixed ammonia salts it contains.

(3) Instal a mechanical system, such as the improved Crossley fan, in the gas stream as it leaves the retort house governor. This system has been used for the removal of tar fog from coal gas, with encouraging results. Further experiments are being carried out, but the results are not yet available. One disadvantage lies in the power taken, but I understand this has been reduced. Further, it has been found that with the installation of turbo exhausters the tar content of the oxide used for purification has been reduced, and that there is a constant trickle of tar leaving at the impeller chamber drain. Thus it would appear that a combination of these latter two methods would be of advantage—that is, instal a modified form of turbo exhauster in the hot gas stream, rather than the present type after the condensers.

There is another aspect of the question of absorption of phenolic bodies from the tar by the liquor. Skirrow showed that practically as much phenol goes into the effluent, and is wasted, as can be obtained from the distillation of the tar.

Put concisely, attention to the following points will tend to an improvement in gas-works liquor.

(1) Remove the tar from the gas as soon as possible, preferably above the dew-point of the gas. The more complete the removal of the tar at this early stage, the better. Do not allow liquor to remain in contact with tar any longer than is necessary.

(2) Move towards wet purification plant having short time contact—that is, rotary or centrifugal scrubbers and water condensers rather than tower scrubbers and atmospheric condensers.

(3) Cut down the air infiltration to the retorts and plant to a minimum, admitting that necessary for the revivification of the oxide *in situ* under pressure at the inlet to the purifiers.

(4) Deal with the condensate from the purifiers separately, and instal, if possible, a cyanide extractor.

From the point of view of the contamination of the liquor, the change from the horizontal to the vertical retort system has made matters worse; the relative O/A figures being 610 and 1130. The increase is almost entirely due to phenol and the colour-producing bodies.

LIQUOR TREATMENT.

In the normal sequence of events at gas-works, liquor is treated in a still for the formation of sulphate of ammonia or concentrate of ammonia. The waste products leaving the plant in liquid form are the still effluent and the "devil" liquor, and contain thiocyanate, thiosulphate, and phenolic bodies. Usually the effluent is run to settling tanks, to remove any traces of tar and to settle out the suspended matter; and it is the final effluent leaving these tanks which forms the substance of our problem. Several factors influence the concentration and percentage of the oxygen-absorbing constituents in this effluent:

(1) The amount of live steam used in the still will affect the volume of this effluent.

(2) Whether or not the still is limed. If limed, there is an increase in volume (unless effluent is used for the production of the lime water) and also there is a slight reduction in the O/A figure due to formation of the calcium salts. Again some of the colour-producing bodies tend to coagulate and settle out with the sludge. If the still is unlimed, there is an increase in the O/A figure of the effluent due to the ammonia in the fixed ammonium salts.

(3) The method of dealing with the "devil" liquor has a decided effect on the character of the effluent.

The "devil" liquor is the drainage from the effluent gas condenser or liquor preheater, and contains a high proportion of volatile phenol. In some works the "devil" liquor is returned to the well; in others it is mixed with the general effluent, or is treated as an entirely separate effluent.

The waste gases leaving the still, being acid, pass through the saturator when sulphate is being manufactured, but are held by the alkaline bath when concentrate of ammonia is the final product. In this latter case the "devil" liquor is practically absent.

The advantage of separate treatment of the "devil" liquor is more marked in the case of the liquor from vertical retorts, where a reduction of 22½ p.ct. in the O/A figure has been obtained.

COLLABORATION NEEDED.

Our problem now resolves itself into the means to be adopted to improve the condition of this effluent before it goes to the sewage works. I suggest that only by helpful collaboration between the two authorities will any marked steps in a forward direction be achieved. The volume of sewage flowing down to the sewage works is just as variable a quantity as the demand for gas. There are variations throughout the day, and at night the flow is small. Surface water complicates the position, and heavy rainstorms upset all calculations. Thus much help can be given to the sewage works in dealing with untreated trade effluent by careful regulation of the flow into the sewer, so as to give a ratio of effluent to sewage as nearly constant as possible. Again, at many works the sulphate plant does not work every day, and thus the production of effluent is a variable quantity.

Thus, if we are to maintain a constant ratio of effluent to sewage, two things are necessary:

(1) Close collaboration between the gas-works and the sewage works.

(2) Storage tanks for the effluent.

When the flow at the sewage works increases to more than three times the normal dry weather flow, due to surface water, the surplus is only treated by rough filtration and settlement before going to the river. When it increases to six times the normal dry weather flow, the surplus is run direct to the river without entering the sewage works. Thus, at times of storm flow, there would appear to be a splendid opportunity to empty the effluent storage tanks, and have a clean start without causing any nuisance.

The above is somewhat qualified by the concentration or variable oxygen requirement of the sewage itself. Where this concentration is high, the addition of gas-works effluent is more objectionable than with a sewage of low oxygen absorbing capabilities. Therefore, in periods of rainfall, the effluent is more easily dealt with than in dry summer weather, when the flow is at its lowest and the concentration at its highest. At these times of maximum concentration, the necessity to regulate the flow is greatest. It would appear to me, therefore, that a possible solution would be to dilute incoming sewage of high concentration with treated outflow water, to ensure a more uniform strength of sewage for the tanks to deal with, or, on the other hand, to reserve a portion of the highly concentrated day flow to mix with the smaller and weaker night flow, to level up the difference between day and night conditions.

We now come to the methods which have been tried, and the suggestions which have been put forward for the treatment of the effluent liquor to improve its nature before it is put into the sewer or water-way.

BACTERIAL PROCESSES.

Several experimental plants have been erected from time to time to investigate the action of bacteria on crude effluent from the gas-works. At first crude effluent was fed to small experimental percolating filters which had been suitably "ripened." It soon became evident that this effluent would have to be diluted if any success was to be achieved, so as to reduce the O/A figure to more reasonable proportions. It was then found that treated effluent could be used for this dilution. The process is a relatively slow one, and requires a comparatively large area to deal with the volume of diluted effluent. Again, the circulation of treated effluent for dilution entails the cost of pumping plant and power.

The Fowler plant for bacterial purification was put into operation at the Bradford Chemical Works, Frizinghall, about 1908, and has been in operation since. The following description, extracted from the "Design and Working of Ammonia Stills," by Parrish, may be of some interest.

> The filters cover half-an-acre in extent, and are constructed of graded clinker from the steam boiler plant. The bottom layer, to the extent of 1 ft. deep, is of 4 in. to 6 in. in size, above which there is a layer of about 1 ft. from 1 in. to 2 in. in size; and finally, there is a layer of 6 ft. from ½ in. to 1 in. in size.
>
> Only one bacterial bed is provided at Frizinghall. It is possible to construct bacterial beds without the erection of retaining walls, merely allowing the ashes to seek their natural angle of repose.
>
> Supernatant effluent liquor divested of lime sludge diluted by fifteen times its own volume of water is pumped over the bed, which has been initially treated. . . . As soon as the effluent liquor leaving the bacterial beds shows a purification of 80 p.ct., this liquor is returned for the dilution of the untreated liquor. . . . The effluent needs to be uniformly distributed over the bacterial bed. . . . As the bacteria sicken an appropriate rest period is necessary; and this is secured at week-ends, &c. . . . The oxygen test of the original spent liquor varies around 560 per 100,000; the purified liquor is 110 parts—a difference of 450. The feed to the filters is about 140 parts. . . . Each year it is found necessary to turn over with a fork the top 8 in. of the filter material, owing to the calcium deposits having a caking effect to this depth. . . . It should be stated that at Frizinghall approximately 30,000 gallons of effluent liquor are treated per day. . . . As an indication of the size of filter beds for the Fowler bacterial treatment of effluent, it may be said that there should preferably be two beds, each of which should be 35 ft. by 35 ft. per ton of sulphate of ammonia manufactured per day. Owing to the isolated position of the Frizinghall plant, the machinery consists of a gas engine and a centrifugal pump in duplicate.
>
> With gas at 4s. per 1000 c.ft., the cost of pumping and circulating the effluent liquor as described represents approximately 2s. per ton of sulphate of ammonia manufactured. . . .

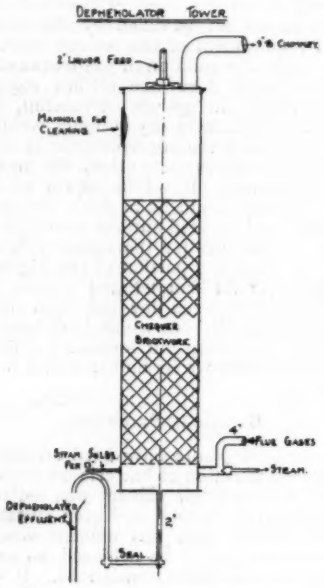
To this cost must be added the usual overhead charges.

In experiments carried out in conjunction with the Alkali Inspector at another works, the effluent was diluted to ten times its volume, and the rate of flow was 70 gallons of diluted effluent per cub. yard per day, giving an improvement in the effluent of about 95 p.ct. In the former case the intention was to improve the effluent, while in the latter case the aim was its complete purification.

It has been found that thiocyanate and phenolic bodies are the most serious offenders; and the removal of these would very materially improve the effluent.

DEPHENOLATING PLANT.

With suitable methods of working the gas-making plant, the thiocyanate content in the liquor can be considerably reduced; but the exclusion of phenolic bodies presents a greater difficulty. Hence a process which will remove the bulk of the phenols will be a distinct help in the attainment of a better effluent. Phenol itself can be removed from a phenolic solution by steam distillation, provided that the solution is acid, so that the phenol is in a free state. It was on this principle that the dephenolating plant at Bolton was erected. A diagrammatic sketch of this plant is shown here.



It is only the free phenol which can be removed in this plant. Assume a gas liquor with an O/A figure of 1100, and that, of this, 350 is due to phenol alone. Then there will be 750 parts remaining due to thiocyanate, thiosulphate, sulphite, and the higher tar acids. It is only the 350 parts which can be removed by this means; and the efficiency of this process is calculated as the proportion of phenol removed in the plant divided by the phenol removable. The test we use for removable phenol is as follows:

Take 100 c.c. of effluent, and acidify with SO_2. Pass steam through the acidified effluent, keeping the solution at boiling-point, so as to keep the bulk constant. After about half-an-hour, allow to cool, and make up to or evaporate down to 100 c.c. Take O/A figure on this, and also on original effluent. The difference figure gives the removable phenol.

The plant consists of a tower 3 ft. 6 in. in diameter and 18 ft. 6 in. high, and contains checker brickwork to a height of 12 ft. The effluent is fed at the top of the tower and distributed, meeting a mixture of boiler flue gases and steam which enter at the bottom of the tower. The function of the flue gases is to render the effluent acid. The flue gases are driven into the tower by a steam injector, and additional live steam is also supplied. The injector jet is $\frac{1}{16}$ in. and is supplied with steam at a pressure of 50 lbs. per sq. in. The injector is coupled to a 4-in. flue gas pipe, and the temperature of these gases is about 300° C.

The phenol-carrying vapours leave at the top of the tower, and are conducted to the base of the boiler chimney and thence to atmosphere. The plant has been found suitable for dealing with 20,000 gallons of effluent per day, and requires about 3000 lbs. of steam per hour. It is comparatively easy to obtain a process efficiency of 90 p.ct., but it is relatively costly to proceed beyond this figure. With an efficiency of 90 p.ct. the final effluent would have an O/A figure of about 800 in the example quoted above. Poor results are obtained if the temperature at the top of the tower is less than 98° C.; and below 95° C. only a 50 p.ct. efficiency is obtained. This temperature must be maintained by steam, as excess of flue gas causes the temperature to fall rapidly. This is due to the absorption of the latent heat of water by evaporation of the liquor, in order to saturate the incoming flue gas.

In the original plant, propeller fillings were used, but were later discarded for chequer brickwork, for two reasons.

(1) The fillings blocked-up rapidly with flue dust combined with traces of tar and oil, and were difficult to clean.
(2) The initial cost of propeller fillings is about ten times as great as that of brickwork.

With chequer brickwork set at a 2-in. minimum spacing, the tower was cleaned out once in six months, as against once in two months with the propeller fillings. The tower has run steadily for the past three years, and has maintained its efficiency; but the cost of running and maintaining this plant is very high.

Another form of dephenolator consists of a long tank placed in the boiler flue; the effluent flowing through the trough being agitated with live steam. This results in partial evaporation as well as acting as a dephenolator.

The question of total evaporation of the effluent fails on account of extreme expense unless there is sufficient waste heat available. For complete evaporation of 20,000 gallons of effluent per day, from and at 212° Fahr., and assuming water only dealt with, we require 200,000 by 1050 B.Th.U. = 200 by 10^6 (say). Assuming 1 lb. of coke = 10,000 B.Th.U., and an evaporation efficiency of 50 p.ct., we get 5000 B.Th.U. per lb. of coke.

$$\text{Coke required} = \frac{200 \times 10^6}{5 \times 10^3 \times 2240} = 20 \text{ tons per day (approx.)}$$

This, with coke breeze at 5s. per ton, is equal to £5 per day.

A process of benzole extraction for the phenol in the effluent has been patented in America, and it is claimed that it is a paying process. The figures do not, however, allow for any loss of solvent. It would appear to me that the volume of effluent, and the low concentration of phenol, coupled with the probability of loss of solvent, would constitute the main drawbacks of this process. Again, the phenol obtained will not be pure, but will contain many of the higher tar acids. The other chemical processes which have been tried have mostly failed from financial considerations, as the resulting product has had little market value. In one case the effluent was made acid with CO_2 or SO_2, and the thiocyanate precipitated as cuprous thiocyanate by addition of copper sulphate.

In conclusion, it has been found that where the percentage of effluent to sewage is less than 1 p.ct., and where the concentration of the sewage itself is not of unusual amount, gas-works effluent can be treated successfully at the sewage works by the activated sludge process, provided that the quantity is carefully regulated to suit the conditions prevailing for the time being at the sewage works. For the moment this would appear to be the only practical solution. Another possible solution lies in the adoption of semi-direct or direct ammonia recovery processes with the corresponding reduction in the quantity of liquor to be dealt with.

Discussion.

Mr. STANIER (Stockport) moved, and Mr. PACKER (Bradford) seconded, a vote of thanks to the author of the paper.

Mr. BATTERSBY (Bury) said they were recovering 10 p.ct. of tar by means of sprays fixed in collecting mains. This was a step towards a better effluent. Continuous working of sulphate plant would also give a constant stream of effluent liquor. Sprays fixed at the bottom of the chimney stack, for ejecting "devil" liquor, were also useful.

Mr. PARTINGTON (Oldham) remarked that the effluent he had dealt with had a 450 oxygen-absorption figure. This liquor was stored for regulation of flow, and was sent to the sewage works. He suggested that a co-operative scheme for liquor distillation at the seaboard seemed a feasible solution.

Mr. SINGLETON (Stockport) suggested that it was difficult to introduce a fixed ammonia spray when the gas left the retort at a low temperature. He asked if the author had carried out any dew-point determinations on vertical retort gas. He observed that the coke used for the steam production for the dephenolating plant would be about 6½ tons per day. This seemed a high figure.

Mr. STANIER thought that the virgin liquor would still be of an obnoxious nature, even after the fixed ammonia spray had been used. He suggested an oxygen-absorption figure of 1100, and asked if Mr. Smith could confirm this.

Mr. SMITH replied that he had been unable to obtain a figure for the virgin liquor when the fixed ammonia spray was in operation; but even in the event of the liquor having an oxygen-absorption figure of 1100, the spray process, in the elimination of 90 to 95 p.ct. of the tar, would cut down materially the total phenolic content of the liquor, inasmuch as it would reduce phenolic contamination in the condensers, washers, and scrubbers. Mr. Battersby had shown that other people had to face this trouble; and he was pleased to hear that at Bury all was fairly satisfactory. With regard to the spray in collecting mains, this was a help in reducing the phenolic contamination. In reply to Mr. Partington, he suggested that the main disadvantage to the seaboard co-operative scheme would lie in the cost of carriage of crude liquor to the coast.

Labour-Saving Kitchens.—No. 168 of "A Thousand-and-One Uses for Gas," published by the British Commercial Gas Association, is an illustrated booklet explaining in popular style how gas and coke can solve the servant problem and render the housewife's life enjoyable.

FORTHCOMING ENGAGEMENTS.

[Secretaries of Gas and Kindred Organizations are asked to assist in making this diary of events as complete and useful as possible by sending the earliest intimation of all meetings.]

March 17.—Yorkshire Junior Gas Association.—Meeting in Leeds. Paper by Mr. J. W. Holroyd on "Mains and Services."

March 17.—Scottish Junior Gas Association (Eastern District).—Visit to the Cupar Gas-Works.

March 21.—Southern Association of Gas Engineers and Managers (Eastern District).—Meeting at 28, Grosvenor Gardens, S.W. 1, 2.30.

March 21.—Manchester and District Junior Gas Association.—Visit to the Works of Messrs. W. C. Holmes & Co., Ltd., Huddersfield.

March 24.—Scottish Junior Gas Association (Western District).—Visit to the Kilmarnock Gas-Works.

March 28.—Southern Association of Gas Engineers and Managers.—Annual general meeting at the Hotel Cecil, Strand, W.C. 2, at 2.15.

March 29.—Midland Association of Gas Engineers and Managers.—Annual meeting in Birmingham.

March 30.—London and Southern District Junior Gas Association.—Meeting in the Westminster Technical Institute. Paper by Mr. F. C. Smith, of the Gas Light and Coke Company.

April 10.—National Gas Council.—Meeting of the Central Executive Committee.

April 10.—Federation of Gas Employers.—Meeting of the Central Committee.

April 13.—British Commercial Gas Association.—Conference of the South Western District at Ilfracombe.

April 24.—Southern Association of Gas Engineers and Managers.—Meeting at Tunbridge Wells.

May 3.—Wales and Monmouthshire District Institution of Gas Engineers and Managers.—General meeting at Tredegar (Mon.).

May 9.—British Commercial Gas Association.—Conference of the Midlands District at Redditch.

May 16-17.—Eastern Counties Gas Managers' Association.—Meeting at Bedford.

May 17.—Society of British Gas Industries.—Annual general meeting at the Hotel Cecil, W.C. 1, under the presidency of His Grace the Duke of Sutherland.

May 18.—Southern Association of Gas Engineers and Managers.—Visit to the works of the Rochester, Chatham, and Gillingham Gas Company.

May 24.—British Commercial Gas Association.—Conference of the Cornish District at Truro.

Institution of Gas Engineers.

April 2.—Special General Meeting of the Institution for submission of Terms of Royal Charter.

April 3.—Gas Education Committee.

May 1.—Refractory Materials Joint Committee.

May 8.—Executive Committee of Gas Education Committee.

June 12-15.—Annual General Meeting at Cardiff.

July 10.—Gas Education Committee.

Oct. 9.—Gas Education Committee.

Nov. 13.—Executive Committee of Gas Education Committee.

Dec. 11.—Executive Committee of Gas Education Committee.

PRINCIPLES AND PRACTICE OF STOKING.

By E. W. L. Nicol, Assoc.M.I.E.E., Assoc.Inst.C.E.

[Résumé of a Lecture at the Royal Sanitary Institute, March 5.]

The author said smokeless combustion and efficient combustion are largely synonymous terms. The main object should be to exclude from the furnace all air in excess of that necessary for the complete combustion of the fuel.

One pound of bituminous coal requires, theoretically, about 12 lbs. of air for its complete combustion; but in the best practice a minimum of 18 lbs. is usually allowed. The corresponding furnace temperature, with this proportion of air, is about 2750° Fahr. The gases evolved from the coal ignite and burn completely at this temperature, without the formation of visible smoke; there is a maximum of radiation from the fuel; and the greater the radiation, the lower will be the chimney losses and the more effective becomes the transmission of heat to the water and steam inside the boiler. The corresponding CO_2 content of the flue gases is about 12 to 13 p.ct.; and these conditions represent first-class practice in the case of coal-fired boilers. Owing to the use of 100 to 150 p.ct. excess air, as in ordinary practice, 6 to 8 p.ct. of CO_2 is quite usual, and often more than the average; the corresponding furnace temperatures being too low by 1000° Fahr. to effect rapid ignition and complete combustion of the volatile gases, with consequent smoke formation and waste of fuel, amounting to 25 p.ct. or more.

Coke, which is almost entirely devoid of hydrogen and volatile matter, requires less than half the amount of excess air usually allowed for coal, and gives 14 to 16 p.ct. CO_2 in ordinary practice, with correspondingly high temperature and radiation. That is one reason why coke is almost invariably used where high temperatures are required, as in steel melting.

The first principle to be observed in stoking should, therefore, be to exclude from the furnace, so far as is practicable, all cold air in excess of that necessary to burn the fuel at the highest possible temperature. But this quantity of air falls short of that required to burn raw coal completely. This happens almost invariably where the fuel used is bituminous coal of the ordinary description, containing about one-third volatile combustible matter and two-thirds fixed carbon, with the usual proportion (3 to 5·5 p.ct.) of hydrogen. The volatile matter is liberated very rapidly when the coal is thrown into the furnace. The gas evolved requires for its combustion less time, and considerably more air, than an equal quantity of the fixed carbon remaining on the grate, which needs, in practice, only a comparatively small quantity (about 30 to 50 p.ct.) in excess of that theoretically required; so that the combustion of bituminous coal is at best a compromise between the quantity of air necessary to maintain the highest temperature in the furnace and that requisite to effect complete or smokeless combustion. It means striking the best possible balance between loss of heat units through incomplete combustion on the one hand, and losses through heat being carried away by the excessive air supply on the other hand.

Influence of Boiler Design.

Another well-known cause of incomplete combustion and smoke formation is inadequate furnace or combustion space. The hydrocarbon flame, coming too soon in contact with the relatively cool heating surfaces of the boiler, is extinguished—it cannot possibly burn in actual contact—thus causing the deposition of soot and, consequently, the emission of visible smoke, as well as impairing very seriously the efficiency of heat transmission, owing to sooted heating surfaces.

From the coal-burning point of view, the design of all internally-fired boilers leaves much to be desired, and necessitates special precautions and appliances. The furnace is almost completely surrounded by water-jacketed surfaces, and is far from ideal where coal is the fuel used. Worse conditions for the smokeless combustion of coal could, in fact, scarcely be conceived. Boilers of this description include the Lancashire, Cornish, locomotive, and vertical types, which, taken together, probably consume a greater proportion of the coal used in industry than boilers of the water-tube or externally-fired type. The furnaces of these latter are larger, and are provided with a refractory lining—conditions which tend materially to improve and simplify combustion, especially where the boilers are set sufficiently high above the grate to permit of the complete combustion of the hydrocarbon gases.

The solid or fixed carbon constituent of coal is by far the most important. Unlike raw coal, it can most advantageously be consumed in close proximity to, or in actual contact with, the heating surfaces; but in designing a coal-fired boiler furnace it is necessary to compromise, and to choose the lesser of two evils.

Steam boilers of the internally-fired description are by far the most common in this country; and, unfortunately, it frequently happens that they are overloaded. Indeed, the boilers are very often the limiting factor in production; and the fact that increased profits are usually associated with increased production shows the vital importance of keeping a factory running at its full output. So that, while coal must not be wasted in making smoke, the financial aspect of boiler management must always be kept in mind; and though industrial engineers are usually keenly alive to the advantages of smokeless combustion, they are necessarily influenced mainly by the profits earned in the industry which they serve.

The useful life of steam boilers often extends to fifty years or more; and the wholesale scrapping of smoke-producing boilers and the installation of modern apparatus is too much to expect in the cause of smoke abatement. Thus we must necessarily take things as they are, and endeavour to apply principles and practice to existing conditions. The output of steam can almost invariably be increased by the application of impelled draught, which tends also very materially to improve combustion conditions in the boiler furnace.

MIDLAND JUNIOR GAS ASSOCIATION.

Members of the Midland Junior Gas Association visited the Stourbridge Gas-Works on March 3.

NOTES ON THE STOURBRIDGE GAS DEPARTMENT.

The works were established in 1835 by a Company of six shareholders, but it was not until twenty years later that they were incorporated by the Stourbridge Gas Act of 1855. The undertaking was purchased by the Urban District Council of Stourbridge as from Dec. 31, 1892, at a price of about £100,000.

The following comparison will show the progress made in the period that the works have been the property of the local authority:

—	1892.	1927.
Annual make of gas, c.ft.	96,000,000	371,544,000
Main mileage	37	80
Number of consumers—		
Ordinary	1,340	3,261
Prepayment	*Nil*	7,200
	1,340	10,461
Gas cookers in use	*Nil*	6,353

The carbonizing plant comprises a horizontal retort house of a capacity of 900,000 c.ft. per diem, and a vertical retort house containing a "W-D" plant. The latter consists of four settings, each containing four 5-ton retorts. Two additional settings are under construction, and also a waste-heat boiler.

The C.W.G. plant is by Humphreys & Glasgow, and consists of two sets, each of 500,000 c.ft. capacity.

At the conclusion of the inspection, the visitors were entertained at tea in the Town Hall by the Gas Committee.

Alderman S. Fiddian (Chairman of the Gas Committee), in extending a welcome to the visitors, testified to the ability of their Engineer (Mr. C. H. Webb), and said they prided themselves very much upon their gas-works.

The Mayor (Alderman Cook) said he was delighted to be in a position to welcome the visitors to Stourbridge on behalf of the Borough. He considered that Associations such as the one the visitors represented were doing splendid work. They fostered educational and social intercourse, which was good for the industry. He was glad to know that the Midland Junior Association included many men who were actually junior in years. They considered the Stourbridge Gas-Works to be a model of efficiency and management.

Mr. H. R. Hems (President of the Association), proposing a vote of thanks to Alderman Cook, Alderman Fiddian, the Gas Committee, Mr. Webb, and his Assistants, Messrs. Williams, Allen, Gilmore, and Green, said he was particularly struck by the compactness of the works, which, he felt, must lead to low labour charges. Mr. Webb had, no doubt, been faced with a difficult problem when he changed over to verticals some six years previously, owing to the totally different conditions to be encountered and the new coals to be used, but he had achieved something of which to be proud. They had had a unique opportunity of inspecting the vertical plant in course of construction, which had proved most interesting to all those present. He congratulated the Borough upon the possession of such a fine undertaking.

Mr. A. R. Myhill (Junior Vice-President), seconding the vote, said he had been impressed by the system and orderliness prevailing on the works.

The vote was then carried with acclamation.

Mr. Webb, replying, testified to the pleasure it had given them to show the visitors round the works. He said that the arrangement of their sidings was a great help to them in keeping the handling expenses very low. At the present the only manual work was the unloading of the coal trucks, but he hoped that in a short time even this would be done away with.

SMOKE ABATEMENT LEAGUE.

United Conference with Regional Committees at Manchester.

[By Our Special Correspondent.]

Previous to the united conference of Regional Committees of the Smoke Abatement League, which was held in the Lord Mayor's Parlour of the Manchester Town Hall last Thursday, a meeting of the Executive Committee took place there in the morning, which was presided over by Sir Napier Shaw, F.R.S., the President of the League. There was an excellent attendance of delegates from England and Scotland.

Councillor J. Mullins, who has been the life and soul of the movement from its inception in Manchester—the city of smoke—was an able supporter of the President on the platform—especially by reason of the absence through resignation of the active Hon. Secretary for a number of years, Mr. C. Elliott, Assoc.M.Inst.C.E. He has taken up a position at Birmingham.

Fitting tribute was paid to the indefatigable manner in which Mr. Elliott had entered into the organization of the various important conferences and exhibitions during his tenure of office. The last conference and exhibition was held at Birmingham; and although unfortunately not a financial success, the valuable propaganda it was enabled to accomplish well justified all the hard work of preparation and carrying through which was entailed, not only on Mr. Elliott himself, but on many friends and well-wishers of the League throughout the kingdom. Mr. Marsh, who has had considerable experience in organization schemes, and has scientific qualifications, has recently been appointed to succeed Mr. Elliott as Stipendiary Secretary, and great things are expected of him in carrying the League to higher success and usefulness.

The papers read last year at Birmingham, and the discussions upon them, have been published in the form of a bound volume, and all "Journal" readers are recommended to obtain a copy, so valuable are its contents. Subjects as modern as low-temperature carbonization are included. The price was originally 5s.; but the Executive Committee, at their meeting at Manchester, resolved to reduce it to 2s. 6d., and thus bring it within the reach of all advocates of smoke abatement.

The report of the Executive Committee having been presented and discussed, on the motion of the President it was unanimously adopted. The re-election of Sir Napier Shaw as President followed. Mr. Mullins was again unanimously elected Treasurer; and in the resolution acknowledgments were warmly expressed of the untiring and unselfish manner in which he had always devoted himself to the best interests of the League, which it was agreed had done a great work in educating the public. Reference was made to the recently passed (1926) Act of Parliament on Smoke Abatement; and it was resolved that its provisions should be enforced in every case of contravention. Among others added to the Committee (including representatives of the Institution of Gas Engineers) was Dr. H. A. des Vœux.

The meeting of the Executive having terminated, the Lord Mayor of Manchester (Councillor W. Davy) entered the room (which by that time must have contained nearly 200 persons), and in a few words welcomed the League to the city. He said he was satisfied that when people realized the importance of pure air, they would use gas and electricity, with gas for cooking purposes. He remarked that what most impressed him in Manchester during the coal strike was the "real Southport atmosphere" that existed. He prophesied that the time would come—perhaps in a generation or two—when people would have their coal fires removed and replaced by gas or electricity. At the present moment it was simply a matter of finance. Nearly all the industries of the country could be carried on by gas or electricity.

The annual report of the League points out that until some form of low-temperature carbonization fuel can be put on the market at a price to compare favourably with coal, the Committee feel that efforts should be made to popularize the burning of gas coke in the open domestic grate.

The President delivered an address, in the course of which he referred to the unusual sunshine in which the denizens of the city of Manchester were at that moment basking. This was an encouragement to the many workers in their attempts to achieve the objects of the League. Sir Napier proposed, and it was agreed by acclamation, that a hearty vote of thanks be accorded the Lord Mayor and Corporation for the invaluable aid they were giving to the movement.

A paper on "The Public Health Smoke Abatement Act, 1926," was presented in abstract by Dr. des Vœux. The discussion was opened by Dr. Veitch Clark (Medical Officer of Health for Manchester), who pointed out that in his own home he used a type of smokeless fuel, but it proved dearer than using coal. "Smoke is everywhere," he said, "and for the City of Manchester to attempt to control the smoke is ridiculous. Manchester smoke passes over Oldham, and Oldham smoke passes over Manchester. If all local health authorities could, and did, actively administer smoke legislation, there is no doubt that we should have a very great improvement." Smokeless fuel as a source of heat for cooking purposes, contended Dr. Clark, must be reasonably cheap and handy, and must in all respects be comparable to the fuel which the ordinary man or woman used. "Are we," he asked, "prepared to say that the use of gas and electricity is in such a state? I think we can say they can be used quite as healthily and profitably, as far as physical well-being is concerned, as other sources of heat for these purposes."

There is no doubt the conference can be regarded as a great success, and that it will act as an impulse in the great work which it is doing for the nation. Boards of Directors and Gas Committees may expect to have from the delegates attending—worthy of endorsement—a recommendation that they should support financially the work of the League.

INSTITUTION OF CHEMICAL ENGINEERS.

Annual Dinner.

The annual dinner of the Institution took place at the New Prince's Restaurant, on Friday, March 9—the PRESIDENT (Sir Alexander Gibb, G.B.E., C.B.) in the chair. Among those present were His Excellency the German Ambassador (Dr. Friedrich Sthamer), Dr. O. Spengler (Director of the Institute of the Sugar Industry, Berlin), Sir William Alexander, K.B.E., M.P., Sir Hugh Bell, Bart., Sir Richard Redmayne, K.C.B., Dr. W. Rosenhain, F.R.S., Sir Frederic Nathan, K.B.E., Sir Frank Heath, K.C.B., Mr. H. T. Tizard (Department of Scientific and Industrial Research), Mr. F. W. Harbord (President, Iron and Steel Institute), Mr. C. S. Garland, Sir Arthur Duckham, Prof. J. W. Hinchley (Hon. Secretary), Mr. F. H. Rogers (Hon. Treasurer), Mr. H. Talbot, Dr. E. W. Smith, and Mr. J. Arthur Reavell.

After the Loyal Toast had duly been honoured,

FERTILE FIELDS.

Sir WILLIAM ALEXANDER, proposing the "Institution of Chemical Engineers," said that no degree in chemistry or in engineering, however brilliant, must be considered by the holder to be sufficient qualification for the exacting profession of chemical engineering. It was at the best a certificate of faithful preparation; and a degree must also be taken in the rough school of the workshops, of the works laboratory, and of the manufacturing plant. The student who could add to this a practical knowledge of French and German need have no fear that his profession would prove an ungenerous mistress. Proceeding, Sir William indicated one or two fertile fields for cultivation by chemical engineers. The elimination of waste, he said, was one that was not yet covered. The scrubbing of gases in a small plant of low cost and of high efficiency had still to be achieved. Cognate problems were the recovery of solvents and the dehydration of tar without decomposition. There was the field of liquid fuels obtained by synthesis or by dehydrogenation—problems much worked at, but not yet satisfactorily solved. The field of low-temperature carbonization was clearly one for the chemical engineer; and a rich harvest awaited the man who could devise a plant of low capital cost, sturdy, cheap, and continuous in action, giving either domestic or industrial smokeless fuel and bye-products as yet unexploited. In conclusion, he pointed out that the membership of the Institution had grown from 81 in 1922 to 475 in 1928.

The PRESIDENT, in the course of his reply, claimed that chemical engineers must be classed among the basic forms of engineering, and rank side by side with civil, mechanical, electrical, mining, and metallurgical engineers. He extended a cordial welcome to His Excellency the German Ambassador and Dr. Spengler, and remarked that chemical engineers owed a great deal to German brains, German foresight, and German work.

Mr. J. ARTHUR REAVELL, proposing "Kindred Institutions," said the Institution of Chemical Engineers was not founded in any light-hearted way before it was believed that an Institution was necessary. It was at first thought to form a branch or group of one of the older institutions; but after careful consideration, it was realized that chemical engineering was a basic branch of engineering, and that a separate organization was necessary. At the same time, they were indebted in a great many ways to the older institutions for help in every direction; and he wished to acknowledge that on this occasion. He had a dream that one day there would be one big building of great institutions; that there would be harmony and working together which would result in vital work being done for the country; and that in this combination of institutions, chemical engineers would hold no small part.

Mr. L. ST. L. PENDRED, replying to the toast, as President of the Institution of Engineers-in-Charge and Vice-President of the Institution of Mechanical Engineers, said he hoped that some day Mr. Reavell's dream of a combination of engineering institutions would come true. Speaking of the relationship of mechanical engineering to chemical engineering, he said he had been informed that mechanical engineers were leaving their own ranks and going over to chemical engineering, because salaries were offered which the mechanical engineers could not afford. He was afraid, as a matter of fact, that many young mechanical engineers were being tempted to go over to the chemical side without completing their mechanical training; and he could not help feeling that it would be better if the mechanical engineering training was finished before entering into the chemical side.

A GOOD TIME COMING.

Sir ARTHUR DUCKHAM (Past-President), submitting "Our Guests," said that, as one who was in touch with so-called chemical engineering, he had failed yet to find what he regarded as a chemical engineer. He could find an engineer who understood the terrible language of the chemist and how to design a plant for the chemist, and he could find a chemist who could operate that plant; but personally he was coming more and more to the opinion that we should never see that wonderful person who was a first-class chemist and a first-class engineer, who could work-out the reactions and follow them all the way through, and then design the plant. He felt that they would have to be satisfied with chemists who had an understanding of the language and problems of engineering, and, on the other side, engineers who had some knowledge of chemistry. He expressed the opinion that this country was not very far away from a boom, and that a good time was coming. One of the greatest things that ever happened was the general strike, because it undoubtedly brought both sides of industry together, and created a far better feeling for the future. He had recently received a report from an American workman in the employ of his firm who was over here for some special bricklaying work, and received £80 a month for it. This man had now stated to him that workmen in England on exactly the same type of job were able to lay as many cubic feet of brickwork per day as the best workmen in America. That was a splendid revival, and one of the most promising things in this country.

His Excellency the GERMAN AMBASSADOR said it was a grand thing for the experts of different nations to congregate and discuss matters of mutual interest, so as to seek a solution of them. Nothing was more helpful to the creation of mutual ties than that experts should meet and co-operate successfully. Germany would welcome every opportunity for bringing her engineers and scholars into contact with Great Britain, as it gave them an opportunity to learn from this country.

Sir HUGH BELL also replied to the toast in a humorous manner, and stated that his long life had been passed in preventing experts from ruining him, though he could not say that he had been particularly successful.

SAVING BUILDING COSTS.

The "Nautilus Economy" Flue System.

A highly interesting booklet on this subject has been published by the Nautilus Fire Company, Ltd. (Proprietors: The Davis Gas Stove Company, Ltd.), of 60 and 62, Oxford Street, W. 1. Bearing the title "Doing Away with Chimney Breasts," the publication is a comprehensive treatment of the important question of "Economy" flues.

The booklet commences by pointing to some of the advantages of "Nautilus Economy" flues. Among these, the following may be enumerated here: Reduced building costs, in the absence of chimney breasts and stacks; saving of floor space and cubic contents; provision of adequate ventilation; less materials needed for skirtings, cornices, &c.; they can, if necessary, be built against, or into, a partition wall; fireplaces can be erected in any position, irrespective of those in the rooms above and below; heavy scoring of the flue blocks forms an effective key for plastering or rendering; and the flues are quick, easy, and inexpensive to build up.

AN EXAMPLE OF SAVING.

After a general introduction, examples are given to show how great the savings can be by adopting "Nautilus Economy" flues. One instance relates to a pair of artizan dwellings of the parlour type. As first planned, each house was to have a coal cooking range in the living room and a coal grate in the parlour. The scullery was to have a gas wash-copper with a flue-pipe of galvanized iron, and each of the three bedrooms a coal fire placed across a corner—the least expensive method of building breasts.

As re-designed for gas, each house retained the coal fire in the living-room, so that no saving in cost was made there; but gas grates were provided in the parlour and in the three bedrooms. "Nautilus Economy" flues took the place of brick chimneys and projecting breasts, and were also substituted for the galvanized flue-pipe for the gas wash-copper in the scullery. The savings in labour costs were:

—	As Originally Planned.	As Re-Designed for Gas.
	£ s. d.	£ s. d.
Excavator and concretor	3 4 3	0 6 0
Bricklayer and mason	104 2 3	41 6 2
Carpenter	2 3 11	4 17 0
Smith, plasterer, plumber, and painter	63 6 10	63 16 3
	£172 17 3	£110 5 5

Thus the saving in labour costs by using "Nautilus" flues amounted to £62 11s. 10d.

VENTILATION.

A section of the booklet is devoted to a consideration of "Nautilus" flues for ventilation. It is pointed out that the total exclusion of flues from sleeping apartments restricts the occupier's choice of his heating system, and so reduces the market value of the house. More important still, it deprives a bedroom of the most dependable means of proper ventilation. A glazed earthenware pipe, 3 in. or so in diameter, does not make a satisfactory flue. It is inadequate alike for ventilation and for carrying away the combustion products of gas. Explanation is then made that the inside measurements of

"Nautilus" flues were determined with reference to their dual function—to remove combustion products of gas and to ensure adequate ventilation. Not only the size of the flue was considered, but the shape as well; and it was found that the most suitable flue area was one in which the proportion of width to depth was six to one.

Introduced into the flue immediately below the ceiling level, the "Nautilus" ventilating flue block consists of a special concrete flue block and a cast-iron framework—the one forming

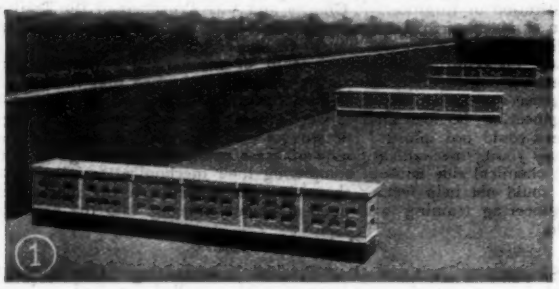


Fig. 1.—The Roof, showing "Nautilus" Terminals.

a vertical partition in the other. The front compartment formed by the partition communicates, through a grating, with the room. The back compartment connects up with the flue top and bottom; and through it ascend both the vitiated air drawn up from the room at the bottom of the flue, and (when the gas fire is alight) the products of combustion.

PRACTICAL POINTS IN ERECTING.

An outline of the incidental advantages of "Nautilus" flues is followed by a consideration of technical details. The final

Fig. 2.—The Building in Course of Erection.

section is headed "Notes on Erecting 'Nautilus Economy' Flues." In this it is stated that an entirely separate flue must be provided for each fire-place. There are no exceptions whatever to this rule. The flue must never be terminated beneath the eaves or on the face of the wall. It should be carried through and well above the roof, to terminate in the concrete stack provided. The orthodox method of flashing to the roof in lead and to the first complete course-joint above the roof is

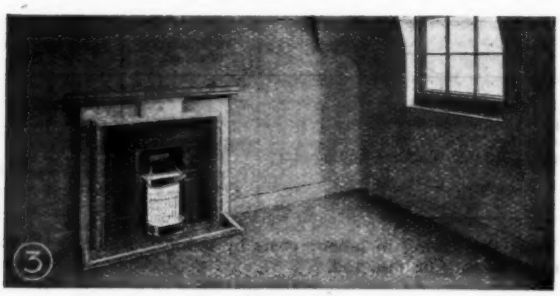


Fig. 3.—A Room in One of the Upper Flats.

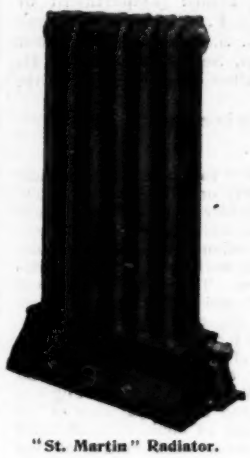
recommended. Since mortar "fangs" inside the flue seriously obstruct the passage of the products of combustion, great care should be taken to clean off any cement that may adhere to the inside of the blocks. A good method of keeping the passage free from mortar is mentioned in the booklet.

The photographs reproduced here are of St. Mary's Abbotts Court, Warwick Gardens, Kensington—a block of high-class flats in which about 4250 "Nautilus" flue blocks have been used.

GAS RADIATORS.

An Installation at the London Palladium.

When the Palladium reopens shortly, under the new control of Sir Walter Gibbons, patrons will see that no efforts have been spared to make this popular house of entertainment the most up-to-date and most comfortable to be found in the country. Among the many improvements that have been effected, the new heating arrangements will have a special interest for readers of the "JOURNAL." No fewer than 79 Wright's "St. Martin" radiators, finished in "old gold," are being installed by the Gas Light and Coke Company throughout the building—in the vestibule and the auditorium, and also "behind the scenes."



"St. Martin" Radiator.

Wright's "St. Martin" is specially designed for theatres, cinemas, public halls, &c., where every safeguard is essential. The burner is totally enclosed, and is lit by applying a light through the special opening provided, after which the aperture is automatically sealed by the closing of the cover-plate. Small coloured glasses in the base of the radiator show when the burner is alight.

The "St. Martin" is "Regulo"-controlled. Lowering of room temperature brings about the needed increase in gas supply, while a rise in room temperature reverses the action, and immediately checks gas consumption and overheating. Specially designed to avoid the necessity of a flue when used in large buildings, the "St. Martin" can be installed practically anywhere.

The "old gold" finish chosen by the Palladium authorities for their radiators is a particularly pleasing and hard-wearing lustrous gold which adds a note of dignity to any colour scheme, and harmonizes with any period of decoration. A visit to the Palladium on its reopening, to see the "St. Martin" radiators in action, will well repay those interested in the heating of public buildings.

DEHYDRATION BY REFRIGERATION.

A paper on the subject of "Gas Dehydration" was presented by G. A. Bragg at the meeting earlier this year of the New Jersey Gas Association. Dehydration, he said, is the next logical step for the progressive gas man in the improvement of the quality of his product and his service to his customers. It will save more than its cost.

After referring to work already done in connection with this matter, the author went on to remark that dehydration of gas by direct cooling with refrigerated water does not involve any unknown dangers. It is simple, positive, and not prohibitively expensive. The apparatus required is all standard equipment, capable of continuous trouble-free operation. A plant of this type would require an ordinary gas scrubbing tower, a refrigerating machine, and a water pump to circulate the water through the cooling section of the refrigerating machine, and then over the scrubber in contact with the gas, the dewpoint of which would be lowered to the temperature of the refrigerated water. The dewpoint of the gas cannot be lowered by this system much below 40° Fahr.; but except in very unusual conditions, the author remarked, this seems ample.

THE CARRIER REFRIGERATING MACHINE.

The refrigerating machine made by the Carrier Engineering Corporation fits, according to Mr. Bragg, very well into a plant of this type. This machine uses ethylene di-chloride as a refrigerant, and a centrifugal compressor, instead of ammonia and the usual piston type compressor. The entire cycle of operation is conducted at pressures less than atmospheric, so that there is never any leakage of refrigerant from the machine. Moreover, the ethylene di-chloride is so modified as to be non-inflammable, and may be handled in open buckets without inconvenience. The centrifugal compressor has no valves or piston rings to leak or stick; and the capacity of the machine may be varied to suit the load by the variable speed motor which drives the compressor. The water is refrigerated by circulation through a tubular condenser. The water passing through the tubes gives up its heat to the ethylene di-chloride which surrounds them. The Carrier machine occupies only about one-fourth of the floor space required for an ammonia machine of the same capacity, and does not require a trained engineer for its operation.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Institution Membership.

SIR,—I believe that it has been usual for the Institution of Gas Engineers to accept for full membership only those candidates who are chief officials of gas undertakings or chief assistant officials of very large works. If, in future, examination will be an essential preliminary, it appears that assistant engineers, and technical assistants who may become otherwise eligible and desirous of membership, will be adversely affected.

I think that a number of associate members will be interested to know whether they will be placed at a disadvantage, compared with men who have become eligible for membership at an earlier date, by reason of their being appointed managers of undertakings of the smallest class, where the responsibilities may be no greater and the requirements as to technical qualifications very much less.

FRANK A. JENKINS, A.C.I.S.

Leamington Spa,
March 3, 1928.

Continuity of Gas Supply from Coke Ovens.

SIR,—Mr. J. W. Brearley's letter in your issue of March 7, referring to the continuity of gas supply from coke ovens, deals with a subject which is of the greatest interest and importance to both gas-works and coke oven undertakings.

His suggestion, however, that coke oven managers fail to realize how large is the number of gas undertakings manufacturing comparatively small volumes of gas per day is hardly accurate. On the coking side there are many plants with small throughputs and correspondingly small gas output, which at the moment, without doubt, would be in a position to supply gas to neighbouring small gas-works, and be prepared, were the price good enough, to give certain guarantees of continuity of supply. In most instances, however, it is more than likely that, as a result of developments which must take place within the next few years in the coking industry if the latter is to do its part in the rehabilitation of the heavy industries of this country, these comparatively small coking plants will inevitably have to go by the board, and they will be replaced, where possible, by larger units having a big throughput of coal and a large output of gas as a consequence. It is then that the situation would arise as to whether it would be economical for the coking plant to remain in operation for a prolonged period during (say) a national coal stoppage, if the volume of gas disposed of to a gas company only amounted to a figure such as that mentioned in the discussion on the paper "The General Scope of the Coke Oven Industry" (200,000 c.ft.); and this for obvious reasons.

On the other hand, no such large coking plant could be erected until the bulk of the gas produced had been disposed of either to a number of small gas-works in the neighbourhood, and/or for industrial purposes. In such a situation, a large coke works would, of course, be prepared to guarantee continuity of supply to the individual purchasers of gas, in view of the fact that the total volume of gas sold to the various purchasers would amount to a considerable proportion of the total produced.

One might just mention one other point in connection with Mr. Brearley's remarks, and that is that just as the small coking plants will have to go, and will be replaced by what one might term mass production plants, so, in due course, will the small gas-works be swallowed up in many areas by the larger undertakings—in which case the point raised in Mr. Brearley's letter would not arise at all. There are always bound to be small gas undertakings in sparsely populated areas, of course, which will be beyond the influence of either large gas-works or coke works

THORNCLIFFE COAL DISTILLATION, LTD.,
R. RAY, Manager.

Thorncliffe,
Sheffield,
March 12, 1928.

Smoke Abatement.

SIR,—The report, which recently appeared in the Press, that the coal merchants of the country have decided to start a campaign with a view to increasing the sales and use of raw coal for household purposes will, it is to be hoped, not escape the attention of those who have the cause of smoke abatement at heart.

Most authorities are agreed that, taking the country as a whole, the domestic chimney is a worse offender than the factory stack, in respect of both the quantity and the deleterious quality of the smoke emitted. The new Public Health Act which came into operation last July does not deal with domestic smoke, the mitigation of which is purely a matter for voluntary effort on the part of local authorities, house designers and constructors, and the public generally. There has been a steady and progressive reduction in the amount of smoke released from the housetops, due to the replacement of raw coal-burning apparatus by gas cookers and gas fires, as well as other smokeless heating appliances. This smoke abatement has been partially reflected by our improving health statistics.

The projected movement to re-light the smoky coal fires of the country is a retrograde step, since Science is now discovering methods which can turn coal to better uses than pouring valuable chemicals into the atmosphere. It is computed that, even now, smoky atmospheres keep out 40 p.ct. of the available daylight from our industrial districts, and a scarcely lower proportion from congested residential areas. Are we to go back to the bad old days, when the percentage was even higher? As far as existing structures are concerned, we can only hope that householders will realize, and avail themselves of, the advantages of a cleanly and serviceable cooking and heating service, in place of the work and dirt creating coal range and open fire. But more can be done with the houses which have yet to be erected. Municipal and health authorities can do a great deal to ensure the universal installation of smokeless appliances, while architects and builders would find it to their advantage to cut out cumbersome fireplaces with their wide chimneys from new dwellings, and fit in the smaller and less costly flues that can be used with gas fires.

Only by whole-hearted co-operation and the adoption of practical measures, whenever possible, can we hope to deal effectively with the problem of the smoking chimney.

W. ROBERTSON,
Medical Officer of Health.

Edinburgh,
March 5, 1928.

REGISTER OF PATENTS.

Low-Temperature Distillation of Coal.—No. 267,095.

INTERNATIONAL COMBUSTION ENGINEERING CORPORATION, of New York (Assignees of W. RUNGE).

No. 3036; Feb. 2, 1927.

This invention for low-temperature distillation consists in causing finely sub-divided coal to descend a retort in counter current to ascending hot gases, wherein a portion of the heat in the ascending gases is heat derived from the hot finely sub-divided coke which has left the retort. The coke is received in a current of comparatively cool combustible gas. This conveys it until its temperature is substantially that of the coke, and it is then separated from the coke and used as ascending hot gas, having been wholly or in part burnt, and the hot products of combustion mixed with another gas which may be a part of the separated gas.

The apparatus comprises a retort for distilling finely sub-divided coal, a holder to which the gas produced by the distillation is delivered after treatment, means for transporting in suspension the coke produced by the distillation, means whereby the gas from the holder is delivered to the transporting means for use as the medium in which the coke is suspended and transported, a separator for separating the coke from the gas, and means whereby the gas is returned to the distillation apparatus. There is also a preheater between the separator and the retort, through which preheater the unloaded gas from the separator passes on its way to the retort.

There is also claimed, as a new article of manufacture, a fuel consisting of finely sub-divided substantially hollow coke particles filled or permeated with combustible gas.

Automatic Operation of Plant or Machines. No. 282,505.

POWER-GAS CORPORATION, LTD., and RAMBUSH, N. E., both of Stockton-on-Tees.

No. 23,770; Sept. 27, 1926.

This invention relates to apparatus for the automatic operation and control, according to a predetermined sequence, of the various elements or units of a plant or machine whether these are grouped adjacent one another, or remotely situated from one another or in certain cases from the control gear.

Of the fifteen drawings which accompany the specification, we reproduce three which will facilitate a description on broad lines of the invention.

Fig. 1 is a diagram showing the pilot valves of a hydraulic servo-motor gear and its mechanical drive. Fig. 2 shows the method of mechanical interconnection of the pilot valves; and fig. 3 shows in plan the interlocking mechanism for said valves.

The arrangement shown by way of example includes six pilot valves 1, 2, 3, 4, 5, 6, connected by hydraulic piping with the main valves of a water gas plant; 1 may be the steam valve, 2 the change-over valve, 3 the primary air valve, 4 the stack valve, 5 the tertiary air valve, and 6 the secondary air valve. Obviously more or less valves can be controlled in similar manner as hereinafter described.

Through shaft 8 a motor 7 drives a timing dial 14 continuously;

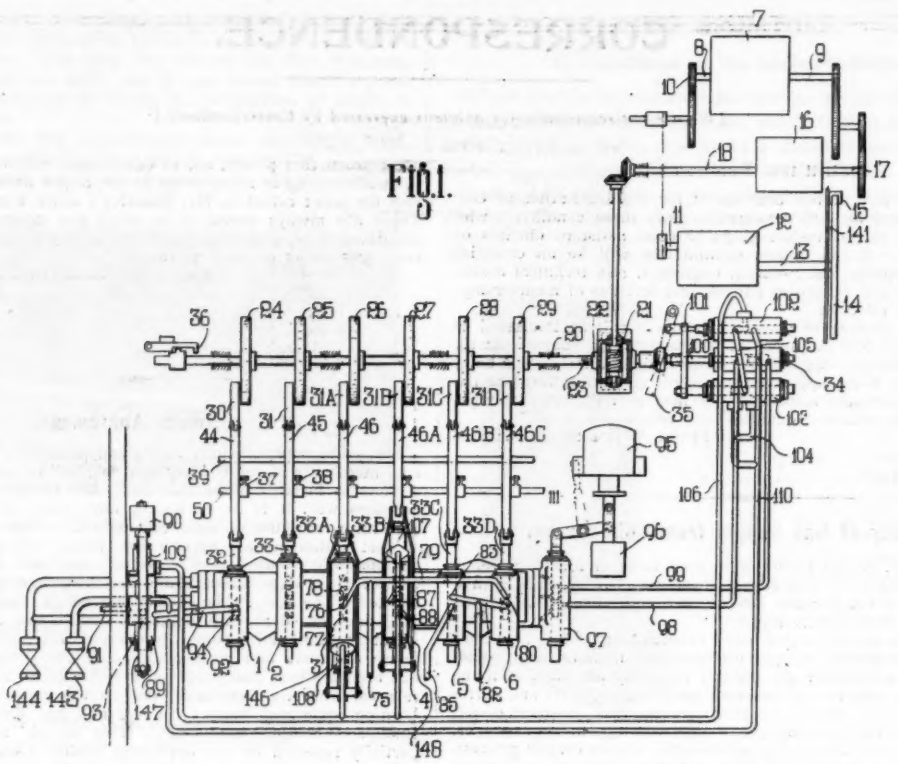


FIG. 1.

AUTOMATIC PLANT OPERATION—THE POWER-GAS CORPORATION, LTD.

and between 8 and 14 is interposed a variable speed gear box 12. Through shaft 9 the motor 7 drives a shaft 17 continuously. 16 is a "one rev. and stop" box. Shaft 18 drives a cam shaft 20, carrying cams 24 to 29, intermittently. Disposed between 18 and 20 is a worm gear 21, 22. Cam shaft 20 is free to travel axially while keeping contact with worm gear 21, 22, by means of feather 23. Timing dial 14 is provided with, in this instance, twelve pegs 15 which act on an external trigger on box 16 and cause the internal mechanism of 16 to clutch 17 and 18 together for the duration of one revolution and then declutch again.

The ratio of the worm gear in this instance is 12 to 1.

Cams 24 to 29 are disposed in phase relation so that the relative motion of pilot valves and the ultimate opening and closing of the main valves of the plant is definitely predetermined. Each groove of the cams engages a pin on a link 30, 31, connected to the valve rods 32, 35 of the pilot valves 1 to 6 as the case may be.

In certain cases it may be desirable or necessary to disconnect the mechanical drive, consisting of the shaft 20 and cams 24 to 29, from the pilot valves. This is effected by sliding this shaft 20 axially in its bearings until arrested by stop 36; and when this is

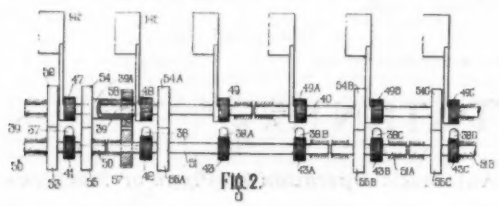


FIG. 2.

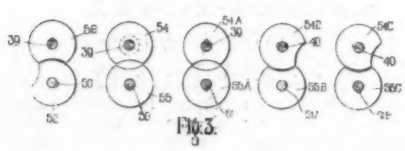


FIG. 3.

done, the grooves of the cams disengage from the pins or links 30, 31. The valve spindles 32, 33, &c., can be operated by hand levers, 37, 38, &c., which are fixed to pinions meshing with backs of racks 44, 45, 46, &c. The racks also mesh with pinions 47 to 49 on shafts 39, 40.

A locking disc is connected with each rack arranged on either of the parallel shaft lines 39, 40, or 50, 51, 51A, and 51B, fig. 3. It will be seen that disc 52 cannot move until 53 has moved to allow the circumference of 52 to pass through the cut-away portion. Also, when 53 has moved and 52 as well, 53 cannot return to its former position until 52 has first returned.

Again, discs 54 and 55 are both free to rotate; but when one is moved, the other is locked until the first returns to its original position. The combination of locks is described in the complete specification; it should be noted that in certain circumstances the steam valve is locked open. Certain main valves are locked hydraulically—for instance, the tertiary air valve 5 depends for its pressure fluid on the position of secondary air valve 4, and in turn 4 depends for its supply of pressure fluid on the position of primary air valve 3. Thus it will be seen from the arrangement of connections that unless secondary air pilot valve 6 is open, tertiary air pilot valve 5 cannot open; and unless primary pilot air valve 3 is open, secondary air pilot valve 6 cannot open.

An emergency cylinder 108 is disposed on bottom of primary air pilot valve 3, and another 107 on top of stack pilot valve 4. A complete separate steam valve 89 is provided for emergency purposes with an emergency cylinder 109 on top. The spindle of emergency steam valve 89 is kept in its normal bottom position by weight 90.

As hereinafter shown, when irregular working occurs, it will cause the electric current flowing through solenoid 95 to be broken and allow weight 96 to drop, reversing the main emergency valve 97, putting the hydraulic fluid in pipe 98 under pressure instead of normal exhaust and in 99 under exhaust instead of normal pressure. Cylinder 34 will pull out shaft 20 with its cams, valve 103 will be reversed, and the fluid in emergency cylinders 107, 108, 109, will be under pressure instead of normal exhaust. Main primary air valve and main steam valve will close and main stack valve will open, and the plant will be in a safe condition for dealing with the emergency. To reset the pilot valves, the emergency cylinders must first be released of pressure by pulling handle 35 to the right and so sliding spindle in relief valve 102 to put emergency cylinders in communication with exhaust pipe carrying isolating valve 143.

As for the electric wiring and fittings, limit switches are disposed in position to be operated at bottom and top extremities of main valves. Change-over switches are operated by pilot valve spindles or racks; solenoid 95 being linked up in the same circuit. When a pilot valve moves to open a main valve, it swings its change-over switch to make a circuit which will also pass through top limit switch, the circuit through bottom limit switch being broken. During the travel of main valve from closed to open position, both circuits are broken; but during this time the current is by-passed through a temporary time contact switch. This switch is controlled by a trigger from the timing dial, and is closed only for a period sufficient for main valve to complete its travel. If main valve fails to reach the end of its travel before temporary time control switch is open again, the circuit will be broken; the solenoid 95 is de-energized; and the emergency hydraulic cylinders come into operation at once as hereinbefore described. The motor will not immediately stop, but will rotate cam shaft to a definite predetermined stopping and starting position at which the solenoid, previously de-energized, may be pulled in by means of a spring and so break the circuit to motor and brake. Means are also provided for setting emergency gear in operation due to an overload on the motor, for starting and stopping motor by hand, for giving audible warning that an emergency has occurred, and for indicating the position of each main valve.

Charging Furnaces.—No. 283,238.

POWER-GAS CORPORATION, LTD., and RAMBUSH, N. E., both of Stockton-on-Tees.

No. 19,250; Aug. 4, 1926.

This invention relates to processes and apparatus for the mechanical charging of furnaces, &c., and especially of water gas generators. The process, according to the invention, consists in charging into a two-valved receiver, through the upper valve, a quantity of

material sufficient to feed the furnace for a relatively long period of time, the lower valve being shut; then shutting the upper valve, and opening the lower valve, and by means of a mechanical feeding device feeding the material into the furnace.

The invention also comprises an apparatus for charging solid material into gas generators comprising a hopper adapted to receive a charge from a stationary or travelling bunker, said hopper having two isolating valves, one or other being always shut to isolate the generator from the atmosphere, and mechanical feeding means for continuously or intermittently feeding the material from the hopper into the generator.

The isolating valves, especially those of water gas or producer gas generators, may be regulated by, or in combination with, an automatic means governing the operation of the furnace, such as that described in patent No. 282,505 (see *ante*).

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal."]

Nos. 3586—4418.

BARRALET, J. H.—"Means of heating water by gas." No. 4289.
BARRALET, T. E.—See Barralet, J. H. No. 4289.
BROADHEAD, R. W.—"Gasholder." No. 3926.
BROCKLEBANK, T. H.—"Incandescent gas lamps." No. 3981.
CARR, W. M.—"Gas meters." No. 3838.
CHEMICAL ENGINEERING AND WILTON'S PATENT FURNACE COMPANY, LTD.—"Drying fuel gases." No. 4248.
CLARK, J. G.—"Down-draught baffling devices for water heaters, &c." No. 3684.
GAS LIGHT AND COKE COMPANY.—See Clark, J. G. No. 3684.
GOLDSPINK, G. E.—"Gas meters." No. 4189.
GOULD, F. J.—"Incandescent gas burners." No. 4015.
LUCAS, F. L.—"Gas burners." No. 3814.
OAKLEY, P.—"Gas cookers." No. 4200.
PARKER, J.—See Chemical Engineering and Wilton's Patent Furnace Company, Ltd. No. 4248.
PARKINSON & COWAN (GAS METERS), LTD.—"Gas cocks." No. 4114.
PARKINSON & COWAN (GAS METERS), LTD.—"Street lamps." No. 4395
RYAN, T. H.—"Gas fires." No. 3774.
SEYD, F. O.—"Electric gas lighters." No. 3873.
STOVES, LTD.—See Oakley, P. No. 4200.
THOMPSON, E. C.—"Gas lamps." No. 3906.
ULLRICH, R.—"Valves for gas meters." No. 4139.
WEIPPERT, E. D.—See Parkinson & Cowan (Gas Meters), Ltd. No. 4114.

Nos. 4419—5201.

BACK, W. H.—"Means for breaking coke." No. 5185.
BARRETT COMPANY.—"Distillation of tar." No. 5152.
DOLPHIN, J.—"Gas burners." No. 5124.
ENGLISH, S.—"Gas lighting devices." No. 4821.
HOLOPHANE, LTD.—See English, S. No. 4821.
HOWLETT & CO., LTD., M.—See Dolphin, J. No. 5124.
NUSS, M.—"Gas burners." No. 4456.
PARKES, D. W.—"Treatment of ammonia liquor." No. 4996.
PERTWEE, H. A.—See Back, W. H. No. 5185.
PHILLIPS, A.—"Gas fires." No. 5077.
ROBINSON, H. W.—See Parkes, D. W. No. 4996.
TOTZEK, F.—"Gas and coke ovens." No. 4901.
TROCKNUNGS-, VERSCHWELUNGS-, UND VERGASUNGS-GES.—"Separation of coke from dry distillation gases." No. 4636.
WILKINSON, H.—"Gas main stopping device." No. 4833.
YATES, H. J.—See Dolphin, J. No. 5124.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Progress of Bills.

Blackpool Extension, Bournemouth Gas and Water, and Dover Gas Bills: Read a second time, and committed.

HOUSE OF COMMONS.

Progress of Bills.

Barnet District Gas and Water Bill: Reported, with amendments.

BARNET GAS AND WATER BILL.

The Bill promoted by the Barnet District Gas and Water Company was considered by the Unopposed Bills Committee of the House of Commons on Wednesday, March 7, and was ordered to be reported for third reading. It deals mainly with water supply, but there are one or two clauses of a general nature applying to the gas undertaking (see "JOURNAL" for Jan. 11, p. 91), to which there are no substantial alterations.

LEGAL INTELLIGENCE.

PUBLIC LIGHTING DISPUTE AT CREDITON.

In the Court of Appeal on Thursday and Friday, March 8 and 9, the MASTER OF THE ROLLS and Lords Justices SARGENT and LAWRENCE dealt with the appeal of the Crediton Gas Company against a decision of Mr. Justice Russell in the Chancery Division dismissing the action which the Company brought against the Crediton Urban District Council. (See "JOURNAL" for Dec. 14 last, p. 759.)

In that action, the Company asked for a declaration that a notice given by the Crediton Council on April 30, 1927, to the appellants purporting to determine, on Aug. 31, 1927, a contract made on March 30, 1909, and a supplemental agreement of June 30, 1921, for the lighting by the Gas Company of the urban district of Crediton, was inoperative and illegal. It was stated at the hearing that neither of the contracts or agreements contained any express provision enabling either party to terminate them. On April 19 last year the Council gave written notice to the Company to end the agreements. In the ensuing litigation the Company contended that the agreements, by which they carried out the lighting of the town, were permanent ones; but the Council replied that there was an implied power that enabled them to render the agreements inoperative at the will of the Council. Mr. Justice Russell said that, although there was nothing in the agreements that inferred or implied any such power, there must be implied a power to either party to end the contract on notice in writing, and such notice had been given by the Council. Consequently, the Company's action was dismissed with costs. Against the decision the Company appealed.

Mr. GRANT, K.C., for the Company, said the question was whether the agreements were perpetual in nature, or whether there was an implication that either party could terminate them by notice in writing. Mr. Justice Russell's finding was that there was an implied general right to determine, and that the Council had exercised that right. He submitted that this decision was wrong, and that the Judge did not adequately consider the whole questions surrounding the two agreements. The Council, to terminate the agreements, should either go to the Company and make a bargain, or apply to Parliament for the necessary powers. The town of Crediton was now obtaining electricity in bulk from Exeter for its lighting. The Council could not put into an agreement provisions that did not specifically appear in it.

Mr. SPENS, K.C., on behalf of the Council, supported the judgment of the Court below; contending that there was nothing startling in holding that what was apparently a perpetual agreement should, in the interests of the public, have an implied clause that would enable the Council, who represented the public, to end it on proper notice. It was impossible to say that the agreements were perpetual merely because the Council, at the request of the District Auditor, put their understanding with the Company into writing and sealed it.

The MASTER OF THE ROLLS said the argument centred around the question whether, when an agreement contained no specific determining clause, it should be treated as one that lasted for ever. There was no dispute as to the facts. It was said that the Company were to supply as much gas as the Council from time to time required for the lighting of the locality. The Council had to read the two agreements together, as was done in the case of Acts of Parliament. It was the duty of the Council to determine how many lamps should be used; and, taking it by degrees, the Council could gradually decrease the gas required until the amount demanded was a very small one. There was an important clause in the agreements that dealt with the number of lamps that might be required. Reading the agreements, and bearing in mind that clause, he came to the conclusion that the parties contemplated that, at some time, the contract must have a determination; especially having regard to the nature of the contract, it appeared to him that it could not be successfully argued that the agreements should be binding on both parties for ever. Therefore, the Council having given legal and proper notice to terminate the contract, the appeal should be dismissed with costs.

Lords Justices SARGENT and LAWRENCE agreed that the idea of a perpetual contract was inconsistent with the interpretation of the agreements and against the intention of the parties to them when they were made.

Actions Resulting from a Gas Escape.

In the Court of Session, Edinburgh, before Lord Moncrieff and a Jury, verdicts for the defendants were entered in two actions against the Middle Ward of Lanarkshire District Committee. In the first action sums amounting to a total of £600 were claimed as damages, and in the second a total of £300 was sued for. The defendants, for the purpose of supplying gas to public lamps within their jurisdiction, own and control gas pipes which they have laid in the ground underneath the footway outside No. 80, Church Street, Newarthill. On the morning of Oct. 30, 1926, the household there, including Mrs. Giblin and her three grandchildren, found a strong smell of coal gas in the house, the gas having escaped from the defendants' pipes. Mrs. Giblin and the three boys were sick and vomiting; and a doctor found them to be suffering from gas poisoning and shock. Mrs. Giblin died about a fortnight later. The claimants in the first action averred that her death was due to the accident; and they claimed compensation. In the second action the claim for damages was based on the loss, injury, and damage which the boys suffered. The defendants denied fault. They stated that the escape of gas was due to interference with the pipe by third parties, and not to any want of reasonable inspection; and they averred that Mrs. Giblin's death was due to natural causes.

The Sowerby Bridge Urban District Council have approved a Gas Committee proposal to spend £5000 on a water gas plant.

MISCELLANEOUS NEWS.

LEA BRIDGE DISTRICT GAS COMPANY.

ANNUAL GENERAL MEETING.

The Annual General Meeting of the Company was held on Tuesday, March 6, at the Offices, 63 and 64, Chancery Lane, W.C.—Mr. A. M. PADDON, M.Inst.C.E. (the Chairman), presiding.

The SECRETARY (Mr. Henry Hand) read the notice convening the meeting; and the report of the Directors and the statement of accounts for the year ended Dec. 31 were taken as read.

The CHAIRMAN, in moving the adoption of the report and accounts, said it would be noticed that, in the period under review, the expansion of the business had been a very characteristic one. He could not remember that their Company had ever recorded the somewhat sensational increases which occasionally connected themselves with suburban undertakings; but, similarly, he could not recall any occasion on which they had failed to show some degree of progress. The amount stated in the report of 4·38 p.ct. as representing their increase was a satisfactory one; and although during the current year, in common with other gas undertakings, they had not maintained the same incremental ratio, he could yet assure the proprietors that the business was still going forward. With regard to the capital account, there was very little to which it was necessary for him to draw attention. It would be seen that there had been expended during the year £9576 for capital purposes; but there was an even more significant entry just below that, which showed that they had written-off some £13,160. Thus, had there been no increase in the business at all, they would still have improved the relation between the capital employed and the output of gas. As a matter of fact, they had sold 17 million c.ft. more gas during the year; but this was not a representative figure, because there had been a change in the calorific power of the gas. This 17 million c.ft., however, showed to what extent they had developed their undertaking, while at the same time reducing the capital employed.

FAVOURABLE FINANCIAL POSITION.

It would be noted that the total capital receipts amounted to some £421,000, from which must be deducted, for purposes of comparison, something over £30,000, for sums added on conversion. This left them with not very much more than £400 per million c.ft. of gas as representing their present financial position; and this was further qualified by an entry in the balance-sheet to which he would presently refer. Coming to the revenue account, he might point out that coal had cost some £10,000 less; while the total charges for coal, oil, and coke were £18,000 down. The charges for repairs and maintenance had been kept at a very satisfactory level. They had increased the expenditure on mains, &c., by £2000. There was one eminently unsatisfactory item which showed that for rates and taxes they had had to pay over 3d. per 1000 c.ft.; but those who were aware of the conditions of local politics in the eastern area of the Metropolis would not be surprised at this fact. They could only hope that things would not get any worse. A sum of £2717 had been carried to the special purposes fund; and this represented an increase of over £1000 when compared with the preceding year. The co-partnership fund accounted for £2477. On the other side of the revenue account, sales of gas and rental of meters, stoves, and fittings totalled £213,571, which was £3648 more than for 1926; but residuals, at £35,614, returned nearly £2000 less. The total receipts exceeded those of a year ago by just over £1700. As the total expenditure was £16,000 less, the profit to be carried forward was some £18,000 more.

PROFIT AND LOSS ACCOUNT.

Turning to the profit and loss account, it would be noted that a certain reservation had been made against the increased demand for income-tax that would inevitably come upon the Company in connection with the larger profits. There was brought into account just over £20,000, and there was being carried out a little more than £30,000, involving an improvement of something like £10,000 in their position. Of course, when considering the advance made by the gas industry generally during the past year, one must bear in mind that the immediately preceding period (1926) was very disturbed and far less advantageous. A certain amount of ground had to be made up; and this was included in the improvement now revealed. The reserve fund stood at £31,206, the special purposes fund at £20,956, and the benefit fund at £8504; and the most satisfactory feature of these entries, apart from their amounts, was the fact that they were nearly all invested up to the hilt in independent securities—a policy which most undertakings would like to have adopted. No one would disagree with this principle; but a great many had been unable to effectuate it. In the general balance-sheet, the few exceptional features, again, were entirely in their favour. The investments amounted to £52,162; but a footnote informed them that, at the time the statement was drawn up, they really represented a market value of £56,124. A rather unusual entry, which he fancied would make some of their neighbours envious, showed that the Company had on deposit a sum of £45,000. It might be said that this was too much. In one sense, perhaps, it was; but they were receiving very favourable terms from their bankers—nearly equivalent to what they would have obtained before the war by ordinary investment—so that they were not losing on this account. In the retorts renewal fund (£13,813) they had extremely valuable provision, which constituted considerable strength, used in connection with the revenue account, in respect to repairs and maintenance of works. It was of an anticipatory nature; but it was certainly a great advantage to have this definitely allocated, so that it could be adjusted from time to time with the revenue entry, which in many cases constituted the sole provision in this regard. The total amount to the credit of the co-partnership fund amounted now to nearly £13,000; and seeing that the system had in their Company been established barely six years, he was sure all would agree that this was a very good result. But, as he had so often remarked before, the importance of this matter did not subsist in the amount recorded in this or any other account. The real asset was very much bigger, and was in the improved relationship between the Company and their employees. They might certainly congratulate themselves upon this matter, because everyone had borne a hand in it. That the system was successful he had no doubt whatever. This success was very largely due to the co-partners themselves, who had loyally acted up to the principles underlying the new system, and zealously co-operated with the administration in developing it. They also owed a great deal in this connection to the executive officers. He had always said about movements of this kind that they depended very much in their earlier stages upon the degree of support that they received from the executive officers. In the case of their own Company, this support had never been grudged; and the highly satisfactory conditions which now obtained, and which had not been reached without some difficulty and labour, were largely due to the General Manager (Mr. F. W. Cross), and the co-operation of Mr. Hand, Mr. D. C. Cross, and all others who had in any way assisted in the movement.

POSITION OF THE QUARTERLY CONSUMER.

There were one or two figures which he would now like to place before them, in order that they might be able to form an idea of the nature of the Company's business, which was peculiar in certain respects. It was interesting to know that of all the gas they distributed, nearly 50 p.ct. was taken by the prepayment consumers—to be exact, 47 p.ct.—whereas the ordinary consumers took 53 p.ct. It would make the comparison more remarkable if one deducted from the ordinary consumers what he might term the commercial load. Proceeding to classify the consumers, it was found that nearly 60 p.ct. were prepayment and 40 p.ct. ordinary. Again, taking the matter on a financial basis, of the money received the ordinary consumers contributed only about 48 p.ct., and the prepayment consumers 52 p.ct. Of course, this ratio had been slowly built up; and if they went back twenty years the comparison would be very different. But the lesson was that the favourable expectations of the gas industry attached more to the prepayment than to the ordinary consumer. The prepayment consumer was not only growing in numbers and in the relative proportion of the business of the Company, but he was also growing in the amount of gas he consumed. And this, be it noted, was in connection with a supply of gas which had to be paid for before it was consumed. The ordinary consumer got his gas first, and had forgotten how much he had used by the time that he was called upon to pay for it. A year ago, he (the Chairman) drew attention to the fact that, if the use of gas was to be extended to its fullest possible limit, they would have to create in the mind of the ordinary consumer something of that satisfaction which was evidently felt by the prepayment consumer with regard to the method by which he was charged. It was not a very urgent problem with them, because the prepayment consumer was, taking all things into consideration, the biggest factor; but he thought the question would force itself upon the gas industry generally of whether the charge by quarter was not detrimental to the popularity of gas. He did not think he would be letting them into a very great secret when he told them he believed they would see a very important departure shortly in this regard. He had indicated to them clearly what were his own views in this matter; and now all he could advise them to do was to "wait and see."

The DEPUTY-CHAIRMAN (Mr. G. W. Carey) seconded the motion for the adoption of the report and accounts; and it was carried unanimously without discussion.

THE DIVIDEND.

On the proposition of the CHAIRMAN, seconded by Mr. E. L. BURTON, dividends were declared for the half-year ended Dec. 31 at the rates of 5 p.ct. per annum and 6 p.ct. per annum on the preference stocks, and 7 p.ct. per annum on the consolidated ordinary stock, all less income-tax.

RE-ELECTIONS AND THANKS.

The CHAIRMAN, proposing the re-election of Mr. J. M. Miles as a Director, said they would all be sorry to hear that Mr. Miles was ill, and had been so for some little time past. He had been for many years a most conscientious Director of the Company, unremitting in his attention, and contributing to the administration of the undertaking everything that could be expected from an experienced and sagacious business man. They would wish to re-elect him to the Board, so that on his restoration to health he might again take his part in the affairs of the Company.

The DEPUTY-CHAIRMAN seconded the motion, which was agreed to.

The retiring Auditor, (Mr. H. C. Burton) was re-appointed, on the proposition of Mr. W. B. FARQUHAR.

The CHAIRMAN said he had one other duty to perform, and that was to move a hearty vote of thanks to the executive officers, their staffs, and all the employees of the Company. In the light of what he had been saying to them, they would understand why he included all those who were responsible for the conduct of the Company's affairs—however humble their office might be. It was of the very essence of co-partnership that they should have—as, indeed, they

had—the co-operation of everyone concerned. The accounts which it had been his pleasure to put before them that day could not have attained the excellence which was characteristic of them had it not been for the loyal co-operation of all engaged in the undertaking. It was difficult to speak in adequate terms of their old friend Mr. Cross. He was a most patient and quiet worker; but it was very hard to discover a mistake in anything that he did. He had been associated with the undertaking for 33 years. Of Mr. Cleave Cross the best thing that could be said was that he had grown up under his father's direction, and had proved a not unworthy pupil. In Mr. Hand they had an untiring Secretary, who possessed a full grasp of the details of the business, and who always worked in the most congenial relationship with the Board, whose confidence he enjoyed in a marked degree.

Mr. STANLEY H. JONES, seconding the vote, said he thought the accounts were splendid, and that they reflected the greatest possible credit on everybody concerned.

The resolution having been unanimously endorsed by the proprietors,

Mr. F. W. CROSS, in acknowledgment, said it had been his pleasure to receive these thanks for very many years; but he must now pass them on to the younger generation who carried on the every-day detail work—for it was upon incessant attention to details that the success of such an undertaking depended. As General Manager, he was immensely pleased with the work that was being done.

The SECRETARY also returned thanks, and commented upon the loyalty of his staff.

A cordial vote of thanks to the Chairman and Directors, which was passed on the proposition of Mr. FARQUHAR, brought the proceedings to a close.

NORTH MIDDLESEX GAS COMPANY.

Sales Up 8 P.Ct.

The Ordinary General Meeting of the Company was held on Monday, March 5, at 5, Great Winchester Street, E.C.—Mr. A. M. PADDON, M.Inst.C.E. (the Chairman), presiding.

The SECRETARY (Mr. H. C. Burton, A.C.A.) read the notice convening the meeting; and the report of the Directors and statement of accounts for the year ended Dec. 31 were taken as read.

The CHAIRMAN, in moving their adoption, said that, if it were his duty to criticize these accounts rather than to submit them to the proprietors, there were several matters that would suggest themselves to him as open to this treatment; but he knew there was nothing in the accounts by way of defect which was not amenable to reasonable and simple explanation. The capital was high, and, as shown in the accounts, the price of gas also; but this was practically equivalent to one statement, because the price of gas was more directly and immediately affected by the capital than by any other cause. There were, however, circumstances peculiar to this undertaking which would always serve as an explanation of why the capital was comparatively high. In many cases gas-works were situated roughly speaking in the centre of the area for which they were responsible; and in other instances they were at the side of the area supplied. This, however, was not so with their undertaking. They had a supply to three separate districts, and not one of them was in contiguity to the works. They were, in fact, all considerably removed from the point at which the gas had to be transmitted to them; and this must involve higher capital expenditure, if only on the important item of distributing mains. Another little disability was that they were not on the main line of the railway; and, again, their business had been very rapidly built-up, due to the growing popularity of the district as a residential area. When the various building estates were brought into existence, much had to be done before any rental could be derived from them. All these matters tended to make the capital expenditure, and consequently the price of gas, somewhat higher than they would wish it to be.

REDUCTIONS IN THE PRICE OF GAS.

The report informed them that the sale of gas for the year showed an increase of 249,690 therms, or just over 8 p.ct., compared with that for the preceding year. It also stated that, to meet the additional cost of foreign coal purchased in 1926, the price of gas was raised as from Christmas, 1926, to 12d. per therm. Since then reductions had been made, from time to time, to the existing price of 10·2d. per therm; and since these accounts were printed, the Board had seen their way to make a further reduction, so that from the meter readings for the present quarter the charge would be reduced to 9·8d. per therm. During the year they had expended over £18,000 on capital account, and had written-off some £2300, which left a net addition of just over £16,000. This, being associated with an increased sale of 50 million c.ft., he thought they would regard as very favourable. As a matter of fact, the capital expenditure to produce these results was only just over £500 per million c.ft., which, with the qualifications he had enumerated, could not be considered as at all a discreditable figure. Charges for repairs and maintenance had been kept at such a figure as to ensure absolutely the efficiency of all the works and apparatus to which they referred. A sum of over £5000 had been carried to the special purposes fund and the renewal fund. The total receipts for the year were £20,000 more than for 1926, while the expenditure increased by nearly £13,000, so that the profit was some £7000 up. With regard to the profit and loss account, a sum of £930 was brought into account, and nearly £4000 was being carried forward. There was nearly £2000 transferred to the co-partners' fund, which now amounted to more than £12,000, practically the whole of which was invested in the stock of the Company. They had every reason to be satisfied with the co-operative assistance of the co-partners. He thought, also, the co-partners themselves were gratified at the relations that had been established. As to the future, the Chairman said that gaseous heat was by far the most valuable and effective form of heat. They gave back to the public in gaseous heat nearly 50 p.ct. of the calorific value of the coal supplied. When they supplemented this by the further medium of heat represented by coke and the liquid hydrocarbons, it would be found that the gas industry was in a position to return to the public nearly 90 p.ct. of calorific value, whereas electricity, if it came into competition with them on a heat basis, could only give back in heat the equivalent of 12 tons of coal for every 100 tons consumed. He felt sure, therefore, they might look forward with continued confidence to the further development of the gas industry, of which their undertaking was a small, but, he hoped, well-conducted, unit.

The DEPUTY-CHAIRMAN (Mr. H. A. Lermitte) seconded the resolution, which was unanimously carried.

On the proposition of the CHAIRMAN, a dividend was declared on the standard consolidated stock, making for the year £6 18s. p.ct., less income-tax.

The retiring Directors (Messrs. A. M. Paddon and E. L. Burton) were re-elected; and Mr. W. B. Paton, A.C.A., was appointed Auditor, in succession to the late Mr. Lewis Hardy, F.C.A.

The CHAIRMAN proposed a vote of thanks for their services during the past year to the executive officers, their staffs, and the co-partners. Referring to the Engineer and Manager, he said that in Mr. Trewby they possessed a man of abnormal activity, marked intelligence, and great technical skill.

Mr. LAWRIE TREWBY, in acknowledgment, expressed his indebtedness to the enthusiasm of the staff—an enthusiasm due to co-partnership; and the SECRETARY also responded.

A vote of thanks to the Chairman and Directors was accorded on the proposition of Mr. C. H. RUTTER.

REDUCTIONS IN THE PRICE OF GAS.

Bakewell.

The Bakewell Urban Council have decided to reduce the price of gas by 5d. per 1000 c.ft. from the last reading of the meters.

Blackpool.

The Blackpool Gas Committee have decided to allow consumers of over 150,000 c.ft. per quarter a further reduction of 2d. per 1000 c.ft. The Gas Manager (Mr. J. H. Chew) states that there is every indication that 1927-28 will prove to be the most successful in the history of the undertaking; the disposable balance exceeding that of any previous year. New plant and improved methods are bearing fruit. The estimated revenue for the year was £184,138; and the actual approximate revenue is £204,727. The estimated revenue for next municipal year is £196,742. The estimated expenditure for last year was £157,925, and the approximate expenditure £158,899. The estimated expenditure for the ensuing year is £164,512.

Buxton.

The Buxton Borough Council have decided to reduce the price by 2d. per 1000 c.ft. from the March meter readings. The charges will then be as follows: For private lighting, 3s. 4d.; for cooking and heating by separate meters, 3s. 1d.; and for engines, 2s. 10d. per 1000 c.ft.

Edinburgh.

The price of gas in Edinburgh is to be reduced by 2d. per 1000 c.ft. At the last meeting of the Gas Committee, Mr. H. H. Gracie (the Engineer and Manager) reported that the year's working was likely to result in a substantial surplus; and he recommended that this should be passed on to the consumer as soon as possible. The new price of 3s. 2d., which will be the lowest for twelve years, will take effect as from the recent January-February readings. The Committee's recommendation was approved.

Filey.

The Filey Urban District Council have reduced the price of gas from 4s. to 3s. 6d. per 1000 c.ft.

Haltwhistle.

The Directors of the Haltwhistle Gas Light Company, Ltd., have reduced the price of gas from 4s. 6d. to 4s. 2d. per 1000 c.ft.

Haworth.

The Haworth Urban District Council, last week, approved a reduction in the price of gas by 6d. per 1000 c.ft. The new price is 2s. 7d. per 1000 c.ft.

Liverpool.

The Directors of the Liverpool Gas Company have decided to reduce the price of gas to all consumers through ordinary meters to 7·8d. per therm, as from the December, 1927, quarter meter reading.

Neath.

Owing to the improvement in the finances of the Neath Gas Department, the Committee are now in a position to make a substantial reduction in the price of gas. This will commence from the March readings of the meters, and will amount to 6d. per 1000 c.ft., thus reducing the price to 3s. 11d. In addition to this, the Committee have been able to grant a sum of £500 towards the relief of the rates for the next twelve months. These benefits will amount to £3600.

Plymouth Corporation.

The Plymouth Town Council are reducing the charge to ordinary consumers by 4d. per 1000 c.ft., making the figure 2s. 6d. per 1000 c.ft.—the lowest recorded since 1915. The Committee anticipated, in dealing with their estimates, that, after the repayment of the sum of £12,761 to the reserve fund and the district fund in respect of last year's deficiency, there would remain a surplus of £2244 on the present year's working, and £2966 in the coming financial year. For power purposes the charge will be reduced from 2s. 7d. to 2s. 3d. per 1000 c.ft. From May 1, for the supplies through prepayment meters with Corporation fittings, the quantity per penny will be increased from

19 c.ft., *less* a discount of 8d. per 1000 c.ft. consumed, to 25 c.ft. Where the meters have private fittings, the quantity will be increased from 22 c.ft. to 30 c.ft., the discount in both cases being abolished.

Quaker's Yard.

The Quaker's Yard Gas and Water Company, as from April 1, are reducing the price of gas from 5s. 9d. to 5s. 3d. per 1000 c.ft.

Redhill.

The Directors of the Redhill Gas Company announce a further reduction of two-fifths of a penny per therm (equal to nearly 2d. per 1000 c.ft.) in the price of gas to ordinary consumers outside the borough of Reigate. This reduction will come into force after the reading of the meters for the March quarter.

Royston.

As from the 31st inst., the Royston (Yorks.) and District Gas Company, Ltd., are making a reduction of 3d. per 1000 c.ft. in the price of gas, which will make the standard charge 4s. 3d. For quantities of over 50,000 c.ft. per annum, there will be further reductions extending from 6d. to 1s. per 1000 c.ft., according to consumption. The rents of ordinary meters will also be reduced.

GAS AT THE BUILDING TRADES EXHIBITION.

The Gas Light and Coke Company's Display.

The Gas Light and Coke Company's stand at the International Building Trades Exhibition, Olympia, from April 13 to 26, is being designed by Mr. Walter Tapper, A.R.A., P.R.I.B.A.

The central lounge hall will be used to demonstrate some examples of modern heating by gas, displaying special settings for the latest type of gas fire. The settings will be designed by Mr. Tapper. A display of modern gas cooking equipment is being arranged, comprising one suite suitable for houses costing up to £1000, and another suite for houses costing anything above this figure.

The remaining portion of the stand will be reserved for an exhibition of the suggested methods for constructing the "Economy" gas flue which is now so popular with builders all over the country.

Large drawings will be available, clearly setting out alternative methods for obtaining satisfactory ventilation of gas fires combined with saving in building costs. Examples of different types of flues constructed in the party wall will be exhibited; and the actual flue blocks and terminals will be displayed for inspection.

Various gas appliance manufacturers will also be exhibiting.

GAS COMPANIES' RESULTS FOR 1927.

ALNWICK.

The Alnwick Gas Company held their Annual Meeting for the first time in their handsome new premises in Bondgate, Alnwick. Mr. ROBERT KYLE presided. The Chairman said it was gratifying in these depressed times to be able to report a record year for the Company, especially when they had reduced the price of gas by 10d. per 1000 c.ft. during the year. The Directors had decided to make a further decrease, from the next meter readings, by way of an increased discount equivalent to ⅗d. per therm. He alluded to the death of Mr. James Frater, who had been a Director for 24 years, and Chairman for 22 years. It was resolved to pay dividends of 12½ p.ct. on the "A" stock, 9½ p.ct. on the "B" stock, and 6 p.ct. on the preference stock.

ALTRINCHAM.

A further reduction in the price of gas, of ½d. per therm, bringing the charge to 8d. per therm (subject to the usual discount), was announced by Mr. W. W. BAKER, Chairman of the Altrincham Gas Company, at the Annual Meeting. The Chairman referred to the loss the Company had sustained by the death of their late Secretary, Mr. E. Gibbon, who had been connected with the Company for more than forty years. In moving the adoption of the report and accounts, Mr. Baker said the Company was in a flourishing condition. The large increase in consumption noted during 1926 had been fully maintained, and an additional increase of 4 million c.ft. recorded.

Mr. T. FAIRHURST, Deputy Chairman of the Company, seconded the adoption of the report, and the motion was carried.

The usual statutory dividends were declared.

ANDOVER.

In submitting the report and accounts for the year 1927, Mr. W. P. CLARKE, Chairman of Directors of the Andover Lighting and Power Company, said there was a further increase in the output of gas. The Directors announced a reduction in the price of ½d. a therm, as from the reading of the meters at Dec. 31 last. They proposed a dividend on the ordinary shares and preference stock for the final half-year of 6 p.ct. per annum, less tax, and a similar dividend for the half-year ending June 30 next.

This resolution was carried.

A vote of thanks to the staff, proposed by Mr. E. PARSONS, was replied to by Mr. G. T. TEMBLETT (the Manager).

BARNSTAPLE.

At the Annual Meeting of the Barnstaple Gas Company on Feb. 25, a reduction in the price of gas was announced and a record dividend was declared.

Mr. FRED W. HUNT (Chairman of the Company) said some people were under the impression that gas had reached its zenith, but during the last twenty years the quantity of gas sold in this country had increased 70 p.ct. Over the past seven years, the gas sold by the Barnstaple Company had increased by nearly 20 million c.ft. It said much for the way their Company was administered that they were able to reduce the price of gas to that in force prior to the coal stoppage—to 10d. per therm. The accounts showed an increase in revenue of £515, in spite of the reduction in price. The total expenditure amounted to £20,663, the manufacture of gas costing £2159 less than in 1926, and the profit for the year was £3964, as against £2600. The dividends recommended were 13 p.ct. on the "A" stock and £9 2s. p.ct. on the "B" stock. A Special Order had been obtained authorizing the Company to erect a gasholder at Instow; and to make provision for the outlay on this extension and the development of the business of the Company, additional capital would be required. It was the intention of the Directors to raise this at an early date. He moved the adoption of the report.

Mr. A. J. REAVELL seconded the motion, and the report was adopted.

BLYTH.

Speaking at the Annual Meeting of the Blyth Gas Company, Mr. A. WATT (Chairman) observed that the profit was £12,286. After providing for dividend, bank interest, &c., there was a credit balance of £10,243. During the year the Directors had introduced a maintenance scheme; and it had been decided that, after the reading of the meters for the March quarter, the price of gas should be reduced by 2d. per 1000 c.ft. A dividend was recommended at the rate of £3 17s. 6d., less income-tax, for the half-year ended Dec. 31 last.

CARMARTHEN.

The Annual Meeting of the Carmarthen Gas Company was held on Feb. 23, Dr. L. M. BOWEN JONES (Chairman of Directors) presiding. Submitting the annual report, the Chairman said the year's working had been satisfactory, so much so that the Directors had been able to declare maximum dividends of 7½ p.ct. and 7 p.ct. In addition, it had been decided to reduce the price of gas by 3d. per 1000 c.ft. from March 31 next. The gas exhibition held in May and June, he said, proved an unqualified success.

CHICHESTER.

At the Annual Meeting of the Chichester Gas Company, dividends of 10 p.ct. per annum on the "A" stock, and 7 p.ct. per annum on the "B" and "C" stocks, all less income-tax, were declared. The CHAIRMAN (Mr. W. A. Walker) announced that the price of gas would be reduced by 1d. per therm as from the meter readings for the March quarter.

CORK.

In moving the adoption of the report and accounts at the Annual Meeting of the Cork Gas Company, Mr. W. B. HARRINGTON (Chairman) said that business continued to show very satisfactory results. The gas sold for the year 1927 was only 2·96 p.ct. less than 1926, when they had record sales on account of the coal strike, but it was 15 p.ct. more than 1925. They had made two reductions in the price of gas during the past six months—namely, 1d. per therm on July 1, and ½d. on Oct. 1, which, of course, lessened the rental; but he thought these reductions, coupled with the further reduction of 1d. per therm on Jan. 1 this year, would have the effect of increasing materially the consumption of gas. The residuals also showed a decrease in comparison with 1926, when the price of coke was much higher during the scarcity of coal. On the other hand, the saving in the cost of coal this last half-year more than offset these reduced returns.

He might mention that their Engineer, Mr. McNicholl, brought under their notice some time ago the advantage and advisability of screening and grading their coke. They at once contracted for an up-to-date plant for the purpose, and they expected to have it at work this summer. There had been, as usual, a substantial increase in the use of gas stoves and appliances; the number fixed during the half-year being 482. There was also an increase of 170 in the number of meters fixed.

Mr. R. MORROGH seconded the motion, which was carried.

Mr. M. O'REGAN moved the payment of an ordinary dividend of 8 p.ct. per annum, with a 2s. per share supplementary payment of arrears of previous dividends which were paid at reduced rates.

Sir JOHN SCOTT seconded the motion, which was agreed to.

CROWBOROUGH.

The report of the Directors of the Crowborough Gas and Electricity Company for the year ended Dec. 31 states that the amount of gas sold was again satisfactory. The Directors had entered into negotiation with the Weald Electricity Supply Company, Ltd., for the sale of the electricity part of the undertaking to that Company; and a Bill was being jointly promoted in Parliament with that aim in view. The revenue account showed a profit on gas for the twelve months of £4755, and a profit on electricity for the nine months of £739. The total revenue was £5957, which, added to the amount brought from last year, £7547, made £13,505. The Directors recommended a dividend at the rate of 5½ p.ct. per annum, which will absorb £1650. There remained a balance to be carried forward of £8648.

DOUGLAS.

Presiding at the Annual Meeting of the Douglas Gas Light Company, Mr. C. H. KAY, J.P., the Chairman, announced a reduction of 5d. per 1000 c.ft., to come into effect from April 1 next. The Directors recommended a final dividend for the year of 40s. per share.

Mr. R. E. E. QUILLIAM proposed a vote of thanks to the Engineer and Manager (Mr. A. R. Bissett), the Secretary (Mr. W. Kennaugh),

and staff and employees for their services during the last twelve months.

EASTBOURNE.

The Annual Meeting of the Eastbourne Gas Company disclosed that the year 1927 had been one of considerable growth and prosperity. Six hundred and twenty-one new customers were obtained, bringing the total number of private consumers up to 15,074. As many as 11,304 stoves are let out on hire. The extra consumption of gas in the previous year—34 million c.ft.—has been not only maintained, but exceeded to the extent of 15¼ million c.ft., or 2½ p.ct. The usual dividends of 8¼, 6¼, and 5 p.ct. were declared at the meeting, and the Directors were heartily congratulated on a very successful year's trading. Several speakers testified to the diligence and enthusiasm of the clerical and works staff, who were reported to be a happy and contented band, thanks in no small measure to the system whereby they now share in the profits of the undertaking. A pension scheme was started last year. The DEPUTY-CHAIRMAN (Mr. Frank H. Jones) held out strong hopes of a reduction in the price of gas in a few months' time.

EXETER.

At the Annual Meeting of the Exeter Gaslight and Coke Company, it was stated that the business of the Company continued to expand; the increased sale of gas last year being 145,491 therms. The supply of gas to the Topsham area was taken over as from Christmas last, and new and enlarged mains were now being laid there so as to give consumers a proper service. To enable the regularly increasing demand for gas to be adequately met, the Board had installed enlarged manufacturing plant and distributing mains, to pay for which an additional £50,000 of redeemable debentures had been issued. The balance of profit was sufficient to enable the Board to recommend an additional ½ p.ct., which, with the interim dividend paid in August last, would make the full dividends for 1927 as follows: 10½ p.ct. per annum on the £40,000 original stock, and 7½ p.ct. per annum on the £83,000 new ordinary shares.

The CHAIRMAN (Mr. John E. Daw), moving the adoption of the report, paid a tribute to the late Chairman of the Company (Mr. Hardy Harris) and the Treasurer (Mr. T. Snow), both of whom had passed away. He regretted that Mr. Joseph C. Wippell had resigned his seat on the Board owing to ill health, and welcomed as new Directors Mr. Lewis D. Thomas and Mr. G. A. C. Drake. The Chairman passed in review the chief events of the year. It was very gratifying, he said, to report a continuous increase in customers, who numbered 15,395, as against 12,794 ten years ago. In view of this large addition, the Directors had acquired the adjoining premises, which would give increased showroom accommodation. The Directors proposed to provide a domestic advisory section, in charge of a fully qualified domestic science teacher, who would periodically give lectures on the domestic uses of gas, and be available for giving advice to customers.

The report was adopted, and the dividends were declared.

FARNWORTH.

At the Half-Yearly Meeting of the Farnworth Gas Company, the CHAIRMAN (Mr. W. Watson, J.P.) said that during 1927 sales had been well sustained. No fewer than 264 new consumers were obtained, bringing the total to 9905. The demand for cookers, fires, and other gas appliances was satisfactory. On and after the March quarter, gas charges would be reduced. Dividends of 7½ p.ct. on the consolidated stock "A" and 5½ p.ct. on the "B" and "D" shares were declared.

LAUNCESTON.

Profits of £1075 on revenue account, and £967 on profit and loss account were reported at the Annual Meeting, on Feb. 27, of the Launceston Gas Company, Ltd., when dividends were declared on the ordinary shares of 10 p.ct. and on the additional shares of 9 p.ct., less income-tax.

NEWMARKET.

The Annual Meeting of the Newmarket Gas Company was held on Feb. 19. Mr. R. STEPHENSON, J.P., D.L. (Chairman of Directors), explained that they had had a good year, and the sales of gas had increased by nearly 5 p.ct. They had been able to announce that on Jan. 1 the gas price in Newmarket would be reduced by 1d. per therm—from 1s. to 11d. The increase in their output, following on the increased output of the previous year, had brought them up to the limit of their carbonization plant. The Directors had either to increase the number of retorts at once—which meant building a new retort house of similar pattern, which must be large enough not only to hold the new retorts that must be put in this year, but also to hold a larger number in future. The alternative to this, which was put before the Directors, was to abandon absolutely the system of horizontal retorts, and to spend a little more money and adopt the modern system of verticals. They asked Mr. J. H. Troughton, their Secretary and Manager, to visit as many gas-works as he thought fit, and ascertain which works he was in a position to recommend to the Directors. In the end the Directors visited a plant at Wisbech, and another at Market Harborough; and after those visits he thought there was no hesitation whatever—the Directors unanimously and promptly decided that the proper thing to do at this juncture in Newmarket was to give up the old horizontal retorts and put up a modern system of verticals. Some new capital would be required—perhaps about half the cost. The rest of the capital they had already provided for in other ways. The total resulting economy on the new works would be very substantial indeed. He moved that the report of the Directors be adopted, and that a dividend of £3 2s. 6d. p.ct. be declared.

Mr. H. HOWARD seconded, and the motion was carried.

NORTHWICH.

Progress is recorded in the annual report of the Northwich Gas Company. During the year, new purifiers have been put into operation, and the retort house has been extended to cope with the increased demand for gas. The gas sold during the year ended Dec. 31 last was 88 million c.ft., compared with 83 millions in the previous year. The supply of gas to the Winnington, Hartford, and Witton districts, and to the works formerly supplied by Messrs. Brunner, Mond, & Co., Ltd., was taken over by the Company; and the results were very satisfactory. The revenue account showed a profit of £6966; and after paying interim dividends, interest on loans, and writing-off part cost of new works, there was a disposable balance of £4371. The Directors recommended that dividends be paid at the rate of 5 p.ct. per annum on the preference stock (less income-tax), 7 p.ct. per annum on the ordinary stock (less income-tax), and 4 p.ct. per annum on the preference shares (free of tax), for the past half-year, which will absorb £2043, making, with interim dividends, 5 p.ct., 6 p.ct., and 4 p.ct. respectively for the whole year, leaving a balance of £2327 to be carried forward.

ROCHESTER.

Presiding at the Annual Meeting of the Rochester, Chatham, and Gillingham Gas Company, Alderman E. W. WILLIS, J.P. (Chairman), stated that during 1927 the sales of gas had exceeded those of 1926 by 38 million c.ft. During the year, the price of gas was reduced in three successive quarters; and the Directors had decided to make a further reduction of ⅝d. per therm, which would take effect from the reading of the meters for the March quarter. The premises acquired by the Company in Chatham High Street would shortly be opened as showrooms.

He was sure they would expect him to make some reference to the flooding which took place on the night of Jan. 6 last. The Gillingham Works suffered no damage, but at the Rochester Works the water at the entrance exceeded 5 ft. in depth. A large area inside the works was from 4 ft. to 4 ft. 6 in. under water. The offices, stores, workshops, mess room, governor room, and superintendent's and foreman's houses were flooded, causing much damage. It was not until three days after the flood occurred that they were able to see exactly what their troubles were. Those had been manfully tackled, and now it could, he thought, be safely said that with the exception of paint work, &c., all had been rectified. It gave him particular pleasure, on behalf of the Directors, to acknowledge the work done by the staff and workpeople, not only to safeguard as far as possible the property of the Company, but to maintain the gas supply. The supply was maintained, full pressures were given, and the gas delivered was up to its usual standard.

Councillor T. J. JENNINGS seconded, and the report was adopted.

Mr. E. H. ELLIOT proposed that a dividend of 6¼ p.ct. per annum, less tax, be declared on the consolidated ordinary stock.

Mr. J. STEVENS seconded, and the motion was unanimously carried.

The CHAIRMAN, proposing a vote of thanks to the staff, said that no one knew more than the members of the Board the great value of their Secretary and General Manager, Mr. C. Valon Bennett. He was a man in the forefront of the gas industry, and had this year been elected President of the Southern Association of Gas Engineers and Managers. In May they would have a visit from the Association, who were coming to see their works. The Company were very fortunate in having good men to superintend the various departments and to carry out the work. Concluding, the Chairman paid a tribute to the officials and workpeople in each of the departments.

ROMFORD.

Mr. BEVOUS J. SMITH, Chairman of the Romford Gas Company, presided at the Half-Yearly Meeting on Feb. 25. He stated that steady progress had been maintained in the sale of gas. The increase was equal to 7·27 p.ct., which showed a rise from approximately 163¾ million c.ft. to 175¾ millions. The number of consumers at the end of 1927 was 10,169, as against 8787—an increase during the year of no less than 1382; and during the half-year 1058 cookers, fires, &c., had been disposed of, making 1839 for the whole year.

Dealing with the capital account, the Chairman pointed out that the extension of new mains had called for an expenditure of £2297; and to meet the requirements of new consumers during the half-year, £2814 had been expended on new meters. New stoves, fires, and appliances had called for a sum of £2116; and the usual depreciation on gas holders, stoves, and meters had been written off. The revenue account revealed the fact that coals had cost less than in the corresponding half of 1926. Repairs and maintenance of works had cost more. The replacement of vertical retorts, boiler, exhauster, and coke breaker had been completed. The gross profit was £9503—a very gratifying result, enabling the Directors to recommend the payment of dividends at the usual rates, and carry forward £2735. The Chairman then called attention to the reductions in the price of gas made during the year, totalling 1s. 2½d. per 1000 c.ft. The current price was 3s. 9·9d. per 1000 c.ft. He paid a great tribute to the excellent work which had been done by the staff of the Company.

Dividends of 7½ p.ct. on the "Original" shares, 5¾ p.ct. on the "B" shares, 3 p.ct. on the redeemable preference shares, and 2¾ p.ct. on the irredeemable preference shares, all less tax, were declared.

SHANKLIN.

Mr. R. R. I. RUSSELL, Chairman of the Shanklin Gas Company, presiding at the Annual Meeting, said that the balance standing at the credit of the profit and loss account was £9646, after payment of an interim dividend of 3 p.ct., less tax. The Directors recommended the declaration of a final dividend of 4½ p.ct., making 7½ p.ct. for the year. Gas sales showed an increase of 8·4 p.ct.

The report and balance-sheet were adopted unanimously, and a vote of thanks was passed to Mr. F. C. Taylor, the Engineer, Manager, and Secretary.

SOUTH SHIELDS.

It was announced at the Annual Meeting of the South Shields Gas Company that the Directors had decided to reduce the price of gas at the end of March by 2½d. per 1000 c.ft., equivalent to ½d. a therm. In the absence through ill-health of the Chairman (Sir

James Readhead, Bart.) Mr. T. W. WALLIS (Vice-Chairman) presided. In moving the adoption of the report and accounts, he said there had been an increase of 1251 consumers during the year. The income from the sale of gas amounted to £99,040. Two reductions in the price had been made during the first half of the financial year, equivalent to 1s. 6d. per 1000 c.ft. The income from residual products exceeded last year's figures. The demand for cookers, fires, and other appliances had been well maintained; and during the latter half of the year, no fewer than 13,000 incandescent burners had been fixed in consumers' premises. The profit was £21,918—an increase of £1744.

Mr. HENRY CHAPMAN moved the declaration of a dividend of 4¼ p.ct. (less income-tax) on the consolidated and new stocks of the Company for the half-year ended Dec. 31 last, making 8½ p.ct. for the year; and a dividend of 2¾ p.ct. (less income-tax) on the ordinary stock, making 5¾ p.ct. for the year.

Mr. W. A. ARMSTRONG seconded, and the dividends were agreed to.

WAKEFIELD.

Mr. G. A. MOORHOUSE, presiding at the annual meeting of the Wakefield Gaslight Company on Feb. 19, reported that in 1927 the Company had experienced a reduction in the sales of gas—1926 having been an abnormal year for gas consumption owing to the increased sales consequent upon the coal stoppage. A debit balance of £5133, entirely caused by the coal stoppage, was brought forward. The Company had obtained a Special Order from the Board of Trade giving permission to advance the price to meet this. The price was increased for the first half of the year, but was reduced to the pre-stoppage price as from Oct. 1 last. Much work, he said, had been carried out upon new mains for the housing schemes, and over 1400 new consumers had been coupled up. There was a credit balance to revenue account of £20,470. Final dividends of 4 p.ct. on the ordinary stock and 2½ p.ct. on the maximum stock, making 6½ p.ct. and 5 p.ct. respectively for the year, were declared, leaving a credit balance of £1743 to be carried forward.

WATFORD.

Presiding at the Annual Meeting of the Watford Gas and Coke Company, Mr. E. J. SLINN (Chairman) said that the increased sale of gas amounted to 43 million c.ft.; and this, added to the large increase in 1926, made a total of 94 millions in two years. The profit was greater by £1923; the receipts from gas being up by over £10,000, in spite of the fact that the price was reduced in July last from 11d. to 10d. per therm. The Directors recommended the payment of final dividends at the rate of £4 2s. 6d. p.ct. on the "A" stock and £3 7s. 6d. p.ct. on the "B" stock, less income-tax, making 8 p.ct. and 6½ p.ct., less tax, respectively for the year. A dividend of 6½ p.ct per annum, less tax, on the new £30,000 "B" additional stock, was recommended for the six months ended Dec. 31.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *March* 12.

The position of pitch continues more or less nominal, and little business is reported. The price is said to be to-day about 65s. per ton f.o.b.

Other products are unchanged; creosote being about 8¾d. per gallon, pure benzole 1s. 5d. to 1s. 6d. per gallon, pure toluole about 1s. 10d. per gallon, 95/160 solvent naphtha 1s. 3d. per gallon, and pyridine about 6s. per gallon.

Tar Products in the Provinces.

March 12.

The markets for tar products generally are still quiet. There has been a distinctly better demand for pitch during the past week; and while no considerable business has been recorded, yet some purchases by consumers on the Continent for delivery this season are known to have been made.

For creosote the market is still steady. There is a fair amount of inquiry for both home and export; but prices are a little easier.

Water-white products remain neglected. Crude carbolic is still in keen demand, and the better grades of cresylic acid continue to fetch high prices, particularly for near delivery. Some quantity of crystals carbolic has been sold at existing prices, and there is a certain amount of inquiry for this article from the East.

Naphthalene is firmer, and there continues to be a good demand for hot pressed.

The average prices of gas-works products during the week were: Gas-works tar, 47s. to 52s. Pitch—East Coast, 60s. to 62s. 6d. f.o.b. West Coast—Manchester, 57s. 6d. to 60s.; Liverpool, 60s. to 62s. 6d.; Clyde, 62s. 6d. to 65s. Benzole, 90 p.ct., North, 11½d. to 1s. 0½d.; crude, 65 p.ct. at 120° C., 9d. to 9½d., naked at makers' works; 50/90 p.ct., naked, North, 1s. 2d. to 1s. 3d. Toluole, naked, North, 1s. 3d. to 1s. 4d. nominal. Coal-tar crude naphtha, in bulk, North, 7½d. to 8d. Solvent naphtha, naked, North, 8¾d. to 9¼d. Heavy naphtha, North, 8¾d. to 9¼d. Creosote, in bulk, North, liquid, 7¾d. to 7½d.; salty, 7½d. to 7¾d.; Scotland, 7¾d. to 7½d. Heavy oils, in bulk, North, 8¾d. to 9¼d. Carbolic acid, 60 p.ct., 2s. 3d. to 2s. 4d. prompt. Naphthalene, £13 to £15; salts, £5 to £5 10s., bags included. Anthracene, "A" quality, 2½d. per minimum 40 p.ct., purely nominal; "B" quality, unsaleable.

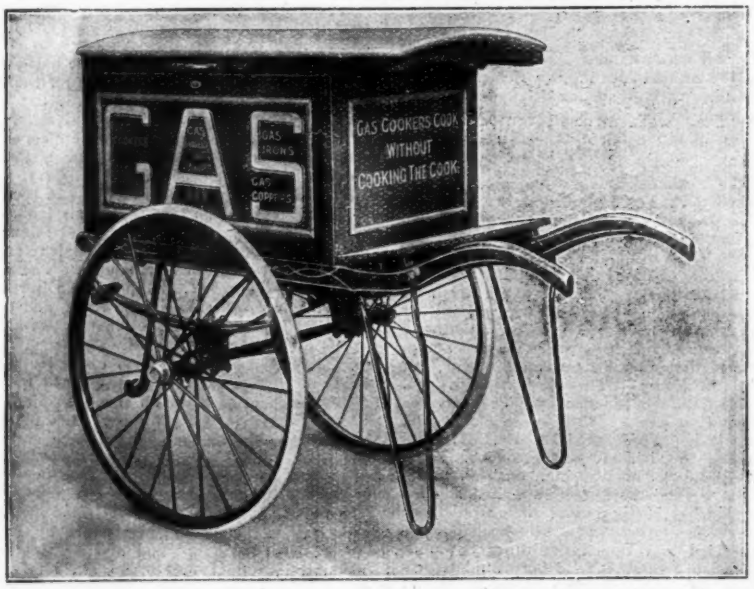
Gas Exhibition at Buxton.—The Buxton Gas Department have arranged for a gas exhibition and a series of cookery lectures and demonstrations to be given for one week commencing April 30. Miss H. H. Tuxford, who was very popular when she visited the town last year, will again be responsible for the lectures and demonstrations.

YOUR COLLECTIONS

WILL BE ACCOMPLISHED QUICKER AND EASIER WITH

THE MODEL COIN COLLECTOR

Hundreds in use.



Prices on application.

SAWER & PURVES

(BRANCH OF METERS, LTD.)

MANCHESTER LONDON NOTTINGHAM

COAL TRADE REPORTS.

From Our Own Correspondents.

NORTH-EAST COAST.

The market is very dull and idle, and additional difficulties have been encountered during the week in the way of local strikes at some collieries, and restriction of output on the part of the men at others. These, of course, are manifestations of discontent at the admittedly low wages now being earned. They can in no way benefit the men, as they merely increase the cost per ton of the coal that is raised, and make it still more difficult to obtain trade in competition with other countries or districts.

The Northumberland steam collieries are still adhering to the agreed minimum prices; and are experiencing a certain amount of idle time. This they are prepared to face, if the ultimate result is to convince the foreigner that these prices are rock bottom. In actual fact, they are at a level which, in most cases, will still show a loss.

In Durham, no scheme has yet taken shape, and, with no improvement in the demand, prices are inclined to slip. Wear Special gas are about 15s. 6d. to 15s. 9d., and best qualities 15s. to 15s. 3d. Seconds quote 13s. to 13s. 9d. There is no demand for coking, and 13s. to 13s. 6d. is quoted, according to quality. Bunkers are very quiet, and best qualities ask 14s. 3d., with seconds nominally 13s. 3d. to 13s. 6d. Gas coke is about 21s. 6d. f.o.b. for shipment.

YORKSHIRE AND LANCASHIRE.

Inquiries are being made in respect of gas coals to be delivered some months hence. Possible action arising out of the adoption of the Three Counties' scheme is the probable explanation of this. The inquiries go as far forward as the beginning of October for a period of twelve months. According to expert opinion, public utility works will be called upon to pay what the trade consider to be economic prices for coal.

Industrial fuel moves steadily, with no abnormal condition prevailing; recent prices having been maintained with some little effort.

Export is confined to prompt parcels, no forward obligations being entered into owing to the general uncertainty of the position.

Secondary qualities of domestic fuel have not maintained recent values, and there have been one or two sharp discounts of the market.

The following are the Humber bunker and export prices f.o.b. usual shipping ports: South Yorkshire—Hards, Association, 15s. to 15s. 3d.; screened gas coal, 15s. 6d. to 16s.; washed trebles, 16s. to 16s. 3d.; washed doubles, 14s. 6d. to 14s. 9d.; washed singles, 14s. 3d. to 14s. 6d.; washed smalls, 11s. 6d.; smithy peas, 17s. 6d. to 18s. 6d. per ton.

West Yorkshire—Hartley's (f.o.b. Goole), 14s. to 15s.; screened gas coal, 14s. 6d. to 15s. 6d.; washed trebles, 15s. to 16s.; washed doubles, 14s. 6d. to 14s. 9d.; washed singles, 14s. 3d. to 14s. 9d.; washed smalls, 11s. to 11s. 6d.; unwashed trebles, 14s. 9d. to 15s. 3d.; unwashed doubles, 11s. to 11s. 3d.; rough slack, 9s. 6d. to 10s.; coking smalls, 9s. to 9s. 6d. per ton.

Derbyshire and Nottinghamshire—Top hards, 15s. to 16s.; washed trebles, 15s. 6d. to 16s.; washed doubles, 15s. to 15s. 6d.; washed singles, 14s. 9d. to 15s. 3d.; washed smalls, 11s. 6d.; rough slack, 9s. 9d. to 10s. per ton.

Yorkshire, Derbyshire, and Nottinghamshire—Screened steam coal, 14s. to 14s. 6d.; gas coke, 21s. to 24s.; furnace coke, 16s. 9d. to 17s. 6d. per ton.

In Lancashire industrial fuel is in moderate demand, and only medium and lower qualities of house coal are in request. Quotations are: Lancashire best house, 31s. to 32s.; seconds, 27s. to 28s.; common, 19s. to 21s.; kitchen, 22s. to 24s.; Yorkshire selected house, 31s. to 33s.; house, 26s. to 28s.; cobbles, 17s. to 19s.; nuts, 15s. to 17s.; washed singles, 12s. 6d. to 13s. per ton in wagons at pit.

MIDLANDS.

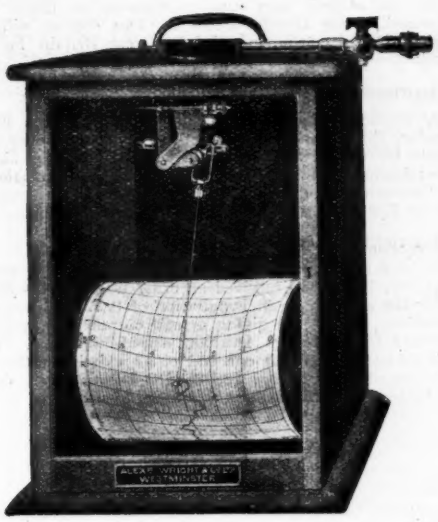
Business is about as discouraging as it can be. Pits are not working more than three or four days a week as a rule, and the prevalence of spot lots on the market shows what difficulty is being experienced in disposing of the restricted output. It is inevitable that prices should be weak and irregular. The malaise extends to practically all branches.

House coal is almost a drug in the market. Collieries' price lists have in many cases very little relevance to the actuality—it is a question of getting the best price obtainable. Demand has collapsed much more abruptly this year than usual.

The call for industrial fuels is no more than maintained. With supplies plentiful, consumers are satisfied to buy no more than the minimum with which they can carry on. The reduced production of slacks and smalls is apparent in relatively firm conditions in big industrial centres like Birmingham; but there is no tension. In Derbyshire slacks are more than sufficient to meet the demand, and prices rule very low. Cost of carriage is to a great extent the determining factor.

Pig iron production is at so low an ebb in the Midlands that the price obtainable for blast-furnace coke continues to droop. Business has been done at 11s. 3d. to 11s. 6d. at the ovens.

Social Activities of the South Suburban Gas Company.—The first annual gathering of the social organization of the Secretarial staff of the South Suburban Gas Company was held at the Hamilton Hall, Forest Hill, on Monday, March 12. The object for which the organization was established was fully achieved, the spirit of comradeship between the heads of departments and the staff showing that such functions are a necessary adjunct to, and a pleasant diversion from, business life. A first-class entertainment was provided by artistes in the top rank of their profession; and all the items were thoroughly enjoyed by the enthusiastic audience. Mr. Wilfrid Wastell is the President of this new branch of the Company's social activities, and Mr. D. Nicholls is the Secretary. The organizers are to be congratulated on the success of their first annual function.



"Large Scale" Drum pattern—
24-hour or 7-day chart
—any range up to 400 lbs. per sq. in.
Can be arranged to record in 1/100".

Approved by GAS REFEREES for Official Testing Stations

Simmance Patent "Dead-Beat" Recorders

have not only a name but a reputation—a reputation for accuracy, reliability, and durability

BUY the BRITISH BEST

ALEX. WRIGHT & CO., LTD.
WESTMINSTER
S.W. 1

Telephone: Victoria 1207
Telegrams: Precision, Sowest, London

TRADE NOTES.

Large Diesel Engine for Ashford.

Messrs. Davey, Paxman, & Co., Ltd., of Colchester, have secured the order for one of their 1035 B.H.P. vertical airless Diesel engines for the Ashford Urban District Council. This engine will be the largest airless Diesel engine installed in Great Britain for central station work.

The "Dielectrimeter."

Messrs. Walker, Crosweller, & Co., of 54-58, Queen Elizabeth Street, London, S.E. 1, announce that they have taken over the sole selling rights for the British Isles and certain countries abroad of the "Dielectrimeter." The "Dielectrimeter" is the portable instrument used for testing the dielectric strength of oils, which was hitherto sold by the Epsom Electrical Engineering Company, Ltd.

"W-D" Intermittent Vertical Chambers for Croydon.

The Woodall-Duckham Vertical Retort and Oven Construction Company (1920), Ltd., have received an order from the Croydon Gas Company for the erection of an installation of "W-D" intermittent vertical chambers, capable of giving a total output of 3,450,000 c.ft. of gas per day from average Durham run-of-mine coal. The installation is to be arranged at one end of an existing retort house, and will be complete with coal and coke handling plant, duplicate waste-heat boilers, and the necessary foundations.

CONTRACTS OPEN.

Retorts.

The Dumfries Gas Department invite tenders for the resetting of two beds of through retorts. [See advert. on p. 709.]

Tar, &c.

The Bromley Rural District Council invite tenders for the supply of tar, &c. [See advert. on p. 709.]

Progress at Bournemouth.

The excellent financial position in which men under the Bournemouth Gas and Water Company find themselves in the co-partnership scheme, and the very friendly relations between employers and employees, were well evidenced at a gathering in the Town Hall, Bournemouth. Both features were commented upon by Mr. William Cash (the Chairman) in welcoming the large company, which on this occasion included the wives. He remarked that since 1908 the total bonus had been over £80,000, which he regarded as a very satisfactory figure. The bonus for 1927 was calculated at the same rate, 8½ p.ct.; and the total amount credited to the co-partners for that period was £9861. Mr. Cash referred to his pride in regard to the pension fund, now in existence ten years, and which at Dec. 31 last showed a credit of £104,966. He mentioned the fifty years' service of Mr. Budden, and said that two collectors (Messrs. W. Evanson and W. J. Morrell) had been with them 44 and 43 years respectively. An announcement of interest from the chair was that, commencing on April 1, the price of gas is to be down to 9d. per therm, which is less than the pre-coal dispute price. The Chairman further stated that the increase in the consumers was for 1926 2586, and for 1927 2669.

Heavy Fine for Theft of Gas.—At Abergavenny, Richard Smart, a plumber and gasfitter, was fined £20, and ordered to pay the costs, for stealing from the Corporation 50,000 c.ft. of gas, by by-passing the meter.

Electricity at Godalming.—The Urban Electricity Supply Company have entered into an agreement with the Aldershot Gas, Water, and District Lighting Company for the transfer of the Godalming electricity undertaking.

An Inconvenient Loss.—Messrs. W. G. Beaumont & Son, contracting painters, of Priory Works, Bow, E., are offering a reward of £100 for the recovery of eight measurement books, which disappeared from their offices last October. They contain records and measurements relating to various jobs which the firm have either carried out or estimated for; and their value to them cannot be estimated in cash. They comprise measurements of gasholders all over the country.

Tully Plant at Wigtown.—For several months Wigtown has been without a gas supply, but has emerged from the difficulties. Messrs. Tully, Sons, & Co., Ltd., of Newark-on-Trent, have installed new gas producing plant in the town, and the price of gas has been reduced from 15s. and 16s. 6d. per 1000 c.ft. some months ago to 8s. 4d. The Tully plant was formally handed over to the Town Council by the contractors on Feb. 13. It produces 40,000 c.ft. every 24 hours from, roughly, one ton of coal, and, so far, has given entire satisfaction.

Tenders for Canterbury Capital.—The tenders for the new capital in the Canterbury Gas and Water Company which were invited by Messrs. A. & W. Richards, on behalf of the Directors, have been opened. Those sent in for the £15,000 of "B" ordinary stock amounted to over £30,000, and ranged from £142 down to the minimum of £133. The lowest successful tender was at £134 11s. 6d. p.ct.; and the average price obtained was £136 14s. 7d. The tenders for the £10,000 mortgages totalled over £20,000; and the amount was subscribed at rates of interest ranging from £4 17s. 6d. to £5 10s.

Glasgow Master Plumbers and Corporation Maintenance.

The Glasgow Corporation Gas Committee have received a deputation representing the Glasgow and West of Scotland Master Plumbers' Association, with regard to the repair and maintenance of gas-fittings and appliances by the Gas Department. It was pointed out by the deputation that this work was being done by Corporation workmen in institutions, mills, factories, mansion houses, and dwelling-houses, and that in some cases days were spent on big jobs without the cost of a penny to the occupiers—the whole expense being borne by the ratepayers. The deputation suggested that the Committee should consider whether the repair and maintenance of gas appliances should not be left in the hands of private firms, instead of, as at present, being executed by the Corporation at the ratepayers' expense. Councillor Paterson (the Convener) pointed out that in 1924 the Committee agreed to experiment with the supervision and overhauling of gas-fittings in the Calton Ward, from which area numerous complaints had been received by the Department. The experiment proved so successful that the Committee decided to extend the scheme gradually; and it was claimed that, in consequence, gas consumers in the city were now obtaining more satisfactory results from the supply, while the dangers of accident were considerably minimized. The deputation having withdrawn, the question was discussed by the Committee, who decided to take no action in the matter.

Nottingham Gas Profits.—Reports of the Nottingham City Auditors show that, as in previous years, the largest sum derived in relief of rates from municipal trading concerns was from profits on the sale of gas and residuals. The profits realized during the last financial period enabled £30,000 to be allocated in rate aid, besides placing the Gas Committee in a position to add substantially to reserves.

Maryborough Gas and Coke Company, Ltd.—The report for the half-year ended Dec. 31, 1927, states that the sales of gas showed a slight decrease. After writing off £300 for depreciation, transferring £206 to reserve fund, and making provision for all other charges, the profits amounted to £1773. The Directors recommended the payment of a dividend of 7 p.ct. per annum, leaving a balance of £329 to be carried forward. The payment of a jubilee bonus of 2½ p.ct. was also recommended.

Buxton Gas Undertaking.—The Buxton Borough Council have considered a statement from the Treasurer on the financial position of the gas undertaking for the year ended March 31. This showed an estimated net profit of £4438. The Gas Committee decided to vote the sum of £1500 out of the profits in relief of the rates. Alderman Wall (Chairman of the gas undertaking) and Alderman Buckley (Chairman of the Finance Committee) complimented the Borough Gas Engineer, Mr. Shaw, upon the efficient administration of the undertaking. The Mayor (Councillor J. J. E. Pugh) also joined in the general praise of his excellent work.

Preference Capital Issue at Redhill.—The Directors of the Redhill Gas Company are offering for sale by tender £25,000 of 5½ p.ct. irredeemable preference "A" stock; the minimum price of issue being £99 10s. per £100. Tenders must be forwarded to the Directors of the Company, Brighton Road, Redhill, by Saturday morning, March 17. The population already supplied by the Company exceeds 50,000. In 1921 the Company acquired the undertaking of the Reigate Gas Company, Ltd., and in 1924 that of the Godstone District Gas Company, Ltd. The area supplied by gas includes Redhill, Reigate, Buckland, Betchworth, Brockham, Walton-on-the-Hill, Kingswood, Chipstead, Gatton, Merstham, Nutfield, Bletchingley, Godstone, Blindley Heath, Lingfield, Dormansland, and part of Horley. The sales of gas in 1914 were 141 million c.ft.; last year they had risen to upwards of 370 millions. The number of consumers at the present time is 10,536. The capital to be raised by the present issue is required for extensions of the works and plant rendered necessary by the increasing demand for gas.

Various gas undertakings of West Yorkshire, it is reported, have arranged to hold a joint exhibition of gas appliances at the Yorkshire Agricultural Show, to be held at Halifax in July.

The adoption of automatic street gas lighting at Yeadon by the Yeadon and Guiseley Gas Company is stated to have effected a saving to the ratepayers of about £200 gross per annum.

The Bradford Gas Committee have authorized the booking of four stands for the Gas Department at a homes, fashions, and trades exhibition to be held at the new Olympia Exhibition Buildings, Bradford, from May 9 to 19.

Bardsea, a growing residential district between Barrow and Ulverstone, has up to the present not advanced beyond oil lighting; but now the residents are considering offers by the Ulverston Urban District Council to provide gas for lighting, heating, and cooking, and by the Barrow Corporation to supply electricity.

The seventh annual meeting of the Cardiff Gas Company's Athletic and Social Club was presided over by Mr. H. D. Madden, who was supported by, among others, Mr. R. J. Auckland, Mr. F. Boardman, and Mr. B. J. Bell. The President heartily congratulated the Club on its success, and pointed out that the number of contributing members was about 700—both sexes being well represented. He then distributed the prizes. The competition for the H. D. Madden Cup resulted in a tie between Bute Terrace and Grangetown, and this will be decided in the tennis section.

STOCK MARKET REPORT.

THE main feature of the past week on the Stock Exchange was the continued buying of industrial shares. The boom, which previously had been confined to the Talking Machine group, spread to Motors and Allied firms, and prices in many instances reached a level for which official figures show no justification. The more sober-minded dealers regard the situation with misgiving, and much stock was withdrawn from the market, but this only led to a further upward movement in prices.

Conditions in the Gas Section were quite good; but, other than *ex* div. variations, there were fewer changes in the quotations. The Gas Light £1 stock quotation was marked down 1½d. to 18s. 9d.-19s., so that the improvement that took place on the change-over from the £100 quotation has now disappeared. The price of the stock, however, is still good, and the yield is lower than on the stock of the other large companies. British ordinary and South Suburban ordinary advanced 1 point, and the South Metropolitan ½ point. Holders of European £10 shares will be gratified by the announcement of a 6 p.ct. per annum dividend (f.o.t.) for the past half-year, which compares with 3 p.ct. for the corresponding period. On the dividend for the past year (5 p.ct.), the yield is just under 7 p.ct.

Attention has more than once been drawn to the low quotation of the Maidstone 5 p.ct. capital stock. A steady 8½ p.ct. dividend has been paid for the past five years, which shows, on the present average quotation of 106½, a yield of £7 19s. 7d. p.ct. While the low quotation is doubtless due to the absence of transactions, it does not justify a continued marking down for *ex* div. quotations. The dealers' attention is drawn to the fact that the stock has been marked down for the last three half-yearly dividends with no subsequent correction. The South Shields consolidated is also ridiculously low, and yields £7 14s. 6d. p.ct. Another case was the Derby consolidated; but on the last Nottingham list, the quotation was raised 8½ points to 110-115.

The following transactions were recorded during the week:

On Monday, Bournemouth "B" 12$\frac{5}{16}$, 4 p.ct. debenture 77, Croydon maximum dividend 84, 85, Gas Light and Coke 18s. 10½d., 19s., 19s. 1½d., 4 p.ct. preference 78, 79¾, 3 p.ct. debenture 60¾, 60¾, 60⅞, Hastings and St. Leonards 3½ p.ct. 72, Imperial Continental 151, Primitiva 21s., 21s. 1½d., 21s. 3d., 4 p.ct. debenture (1911) 75, 75½, South Metropolitan 104¼, 104⅜, 104⅜, 105, 3 p.ct. debenture 60, South Suburban 5 p.ct. 104½, Wandsworth new ordinary 100, 100½. Supplementary prices, Liverpool 5 p.ct. 88, 88½.

On Tuesday, Brighton 5 p.ct. 105, British 111⅜, Commercial 98⅛, Croydon sliding-scale 104. European 8⅝, Gas Light and Coke 18s. 10½d., 19s., 19s. 1½d., 3 p.ct. debenture 61, Hastings 5 p.ct. 91½, 92, Primitiva 21s., 21s. 1½d., 21s. 3d., 21s. 4½d., South Metropolitan 104½, 104⅜, 105, South Suburban 5 p.ct. 105, Wandsworth new ordinary 100½. Supplementary prices, Ascot 4½ p.ct. debenture 78, 78½, Brighton 5 p.ct. debenture 95, Colonial Association new, 1s. 3d., 1s. 6d. pm., new 8 p.ct. preference 1½d., 3d., 4½d. pm.

On Wednesday, Alliance and Dublin 97½, 97⅞, Bombay 22s. 4½d., Brighton and Hove 6 p.ct. consolidated 116½, 5 p.ct. consolidated 105, 106, Continental Union 7 p.ct. preference 93½, 94½, European 8½, Gas Light and Coke 18s. 10½d., 18s. 11¼d., 19s. 0¾d., 19s. 1½d., 3 p.ct. debenture 60½, 60¾, 60⅞, Imperial Continental 151, 152, Montevideo 93, Plymouth and Stonehouse 5 p.ct. 106¾, Primitiva 21s., 21s. 1½d., 21s. 3d., 21s. 4½d., South Metropolitan 104½, 104¼, 105, 3 p.ct. debenture 60. Supplementary prices, Colonial new 1s., 1s. 1½d., 1s. 6d. pm., new 8 p.ct. preference 3d., 6d. pm.

On Thursday, Alliance and Dublin 98, Bournemouth "B" 12, 12$\frac{1}{32}$ *ex* div., 6 p.ct. preference 10⅞, 10$\frac{29}{32}$ *ex* div., British 115½, Cape Town 8½, 8⅝, Commercial 98½, 3 p.ct. debenture 58, 59, Gas Light and Coke 18s. 10½d., 19s., 19s. 1½d., Primitiva 20s. 10½d., 21s., 21s. 0¾d., 21s. 1½d., South Metropolitan 104⅜, 104½, 105, 3 p.ct. debenture 60, South Suburban 105, 106, 5 p.ct. debenture 94⅜, Tottenham "A" 114, 4 p.ct. debenture 76½. Supplementary prices, Brighton and Hove 6 p.ct. "B" preference 108½, 7 p.ct. debenture 104½, 105, Colonial new ordinary 1s., 1s. 1½d., 1s. 3d., 1s. 6d. pm., new 8 p.ct. preference 3d., 6d. pm., Croydon 7 p.ct. debenture 103½, 104, Pinner 5¼ p.ct. debentures 100½, 101.

On Friday, Alliance and Dublin 98, Bournemouth 5 p.ct. 12½, "B" 12$\frac{5}{16}$, 6 p.ct. preference 10⅞, Gas Light and Coke 18s. 9d., 18s. 10½d., 19s., 19s. 1½d., 3½ p.ct. maximum 63½, 4 p.ct. preference 78½, 3 p.ct. debenture 60½, Imperial Continental 150½, Primitiva 20s. 10½d., South Metropolitan 104¼, 3 p.ct. debenture 60, South Suburban 5 p.ct. 107, Tottenham 4 p.ct. debenture 77¾. Supplementary prices, Colonial new 1s., 1s. 3d., 1s. 4½d., 1s. 6d. pm., new 8 p.ct. preference 1½d., 4½d., 6d. pm.

There were no gold movements, and bar gold remained at 84s. 11½d. per oz. Silver was a quiet market; Indian purchases being offset by Chinese sales. The price per oz. was 26$\frac{1}{16}$d.

The Bank Rate is 4½ p.ct., to which it was reduced from 5 p.ct. on April 21. Bankers' deposit rates are 2½ p.ct. The deposit rates of the discount houses are 2½ p.ct. at call and 2¾ p.ct. at notice.

Issue.	Share.	When ex-Dividend.	Dividends. Prev. Hf.Yr	Dividends. Last Hf. Yr.	NAME.	Quotations. Mar. 9.	Rise or Fall on Week.	Transaction Lowest and Highest Prices.
£			% p.a.	% p.a.				
171,978	Stk.	Feb. 9	5	5	Aldershot 5 p.c. max. C.	70—75	..	..
412,992	,,	,,	4	4	Do. 4 p.c. Pref.	69—72	..	..
1,551,868	,,	Sept. 29	7	7	Alliance & Dublin Ord.	95—99	..	97½—98
374,000	,,	Jan. 12	4	4	Do. 4 p.c. Deb.	64—67	..	..
522,654	,,	Mar. 8	7	7	Barnet Ord. 7 p.c.	109—112*	..	..
800,000	1	Oct. 13	1/7½	1/7½	Bombay, Ltd.	21/6—23/6	..	22/4½
170,000	10	Mar. 8	6½	6½	Bournemouth 5 p.c.	12—13*	−¼	12½
500,050	10	,,	7	7	Do. B 7 p.c.	11⅞—12¼*	−¼	12—12$\frac{5}{16}$
375,000	10	,,	6	6	Do. Pref. 6 p.c.	10¼—11*	−¼	10⅞—10⅞
50,000	Stk.	Jan. 12	3	3	Do. 3 p.c. Deb.	58—59	..	..
162,025	,,	,,	4	4	Do. 4 p.c. Deb.	76—79	+1	77
357,900	,,	Mar. 8	7½	7½	Brighton & Hove 6 p.c. Con.	113—116*	−2	116½
311,880	,,	,,	6/8/6$\frac{2}{3}$	6⅔	Do. 5 p.c. Con.	101—104*	−2	105—106
1,387,500	,,	Feb. 23	5	5	Bristol 5 p.c. max.	88—89a	+½	..
855,000	,,	Sept. 29	7	8	British Ord.	113—116	+1	111⅞—115½
100,000	,,	Dec. 22	7	7	Do. 7 p.c. Pref.	114—117	..	..
120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb.	72—75	..	..
200,000	,,	,,	—	33/3	Do. 5 p.c. Red. Deb.	93—96	..	..
100,000	10	Nov. 24	8	8	Cape Town, Ltd.	8—9	..	8½—8⅝
100,000	10	Oct. 27	4½	4½	Do. 4½ p.c. Pref.	6¾—7½	..	..
150,000	Stk.	Dec. 22	4½	4½	Do. 4½ p.c. Deb.	72—77	..	..
436,860	,,	Feb. 23	6	6	Cardiff Con. Ord.	98—101	..	..
237,860	,,	Jan. 12	7½	7½	Do. 7½ p.c. Red. Deb.	101—104	..	..
157,150	,,	Feb. 23	6	6½	Chester 5 p.c. Ord.	86—91b	..	..
79,188	1	Oct. 13	12/-	12/-	Colombo Ltd. Ord.	31/—33/-	..	..
24,495	1	,,	1/4½	1/4½	Do. 7 p.c. Pref.	20/—22/-	..	..
375,402	1	Oct. 13	1/9½	1/9½	Colonial Gas Assn. Ld. Ord.	24/—26/-	..	..
187,848	1	,,	1/7½	1/7½	Do. 8 p.c. Pref.	21/—23/-	..	..
2,073,280	Stk.	Feb. 23	5	7	Commercial Ord.	97—100	..	98½—98½
475,000	,,	Dec. 22	3	3	Do 3 p.c. Deb.	57—60	..	58—59
600,000	,,	Sept. 29	11	11	Continental Union, Ltd.	28—33	..	..
200,000	,,	Mar. 8	7	7	Do. 7 p.c. Pref.	88—93*	−2	93½—94½
187,550	,,	Mar. 8	6½	7	Croydon sliding scale	103—106*	−2	104
408,100	,,	,,	5	5	Do. max. div.	81—84*	−2	84—85
492,370	,,	Mar. 8	7	10	Derby Con.	110—115e*	+8½	..
55,000	,,	Dec. 22	4	4	Do. Deb.	71—73e	..	..
909,000	,,	Mar. 8	5	5	East Hull Ord. 5 p.c.	76—79*	−2	..
50,000	,,	Dec. 22	5	5	Eastbourne 5 p.c. Deb.	90—95	..	..
1,002,180	10	Sept. 29	†3	†4	European, Ltd.	8½—9½	..	8½—8⅝
13,705,480	Stk.	Feb. 9	5	5/1/4	Gas Light & Coke 4 p.c. Ord.	18/9—19/-f	−-/1½	18/9—19/1½
3,600,000	,,	,,	3½	3½	Do. 3½ p.c. max.	62—64	..	63½
4,157,020	,,	,,	4	4	Do. 4 p.c. Con. Pref.	77—80	..	78—79¾
5,603,630	,,	Dec. 22	3	3	Do. 3 p.c. Con. Deb.	60—62	..	60½—61
181,818	,,	,,	6	6	Do. 6 p.c. Br'if'd Rd. Db.	102—105	..	..
1,642,770	,,	,,	5	5	Do. 5 p.c. Red. Deb.	99—101	..	..
42,000	,,	—	7½	7½	Do. 7½ p.c. Ilford Deb.	..	..	..
82,500	,,	Mar. 8	6⅔	6⅔	Hastings & St L. 6 p.c. Conv	87—90*	−2	91½—92
168,740	,,	,,	5⅔	5⅔	Do. 5 p.c. Conv.	68—71*	−2	72
70,000	10	Oct. 13	†10	†10	Hongkong & China, Ltd.	12½—13½	..	..
173,800	Stk.	Mar. 8	5	5	Hornsey Con. 5 p.c.	74—77*	−2	..
1,976,000	,,	Nov. 10	10	10	Imperial Continental Cap.	149—158	..	150½—152
223,130	,,	Feb. 9	8½	8½	Do. 8½ p.c. Red. Deb.	67—69	..	..
235,342	,,	Mar. 8	7	7	Lea Bridge 6 p.c. Ord.	94—97*	−2	..
3,145,907	,,	Feb. 23	6½	6½	Liverpool 5 p.c. Ord.	87½—88½b	..	..
600,000	,,	Sept. 29	7	7	Do. 7 p.c. Red. Pref.	103—105b	..	..
166,786	,,	Feb. 23	9	8	Maidstone 5 p.c. Cap.	104—109	..	..
75,000	5	Dec. 22	†7	†8	Malta & Mediterranean	5⅞—6⅞	..	..
641,920	Stk.	Nov. 24	†7	†5	Montevideo, Ltd.	92—94	..	93
2,061,318	,,	Mar. 8	5	5	Newcastle & Gateshead Con.	16/1$\frac{1}{4}$-16/7$\frac{1}{4}$d/*	+1½	..
360,929	,,	,,	4	4	Do. 4 p.c. Pref.	66—67*	−1½	..
691,705	,,	June 23	8½	8½	Do. 8½ p.c. Deb.	66½—67½d	..	..
131,760	,,	Mar. 8	6/18/0	6/18/0	North Middlesex 6 p.c. Con.	91—94*	−2	..
800,000	,,	Nov. 24	7	9	Oriental, Ltd.	116—121	..	..
188,130	,,	Dec. 22	7⅛	7⅛	Plym'th & Ston'house 5 p.c.	102—107	..	106¾
414,800	,,	Feb. 23	7½	7½	Portsm'th Con. Stk. 4 p.c. Std.	99—102	..	..
226,732	,,	,,	5	5	Do. 5 p.c. max.	74—77*	..	..
2,334,454	1	—	—	—	Primitiva Ord.	20/8—21/8	..	20/10½—21/4½
247,500	100	Dec. 1	4	4	Do. 4 p.c. Red. Deb.	92—96	..	..
695,009	Stk.	Jan. 26	4	4	Do. 4 p.c. Red. Deb. 1911	74—76	..	75—76½
421,183	,,	Dec. 22	4	4	Do. 4 p.c. Cons. Deb.	74—76	..	..
150,000	10	Sept. 29	6	6	San Paulo 6 p.c. Pref.	8½—8⅝	..	..
130,000	50	Jan. 3	5	5	Do. 5 p.c. Red. Deb.	46—48	..	..
270,000	Stk	Sept. 8	5⅔	5⅔	Sheffield A	102—104s	..	..
419,968	,,	,,	5⅔	5⅔	Do. B	102—104s	..	..
1,047,000	,,	,,	5⅔	5⅔	Do. C	102—104s	..	..
90,000	10	May 26	4	6	South African	4—6	..	..
5,602,895	Stk.	Feb. 23	5	7½	South Met. Ord.	103½—105½	+½	104½—105
500,000	,,	,,	—	6	Do. 6 p.c. Irred. Pf.	108—111	..	..
1,895,445	,,	Jan. 12	3	3	Do. 3 p.c. Deb.	59—62	..	60
784,600	,,	Mar. 8	6½	6½	Do. 6½ p.c. Red. Db.	99—101*	−3	..
91,500	,,	Feb. 23	8½	8½	South Shields Con.	109—111 d	+1	..
1,949,795	,,	Feb. 23	6½	6½	South Suburban Ord. 5 p.c.	104—107	+1	104½—107
868,837	,,	Dec. 22	5	5	Do. 5 p.c. Deb.	93—96	..	94⅜
647,740	,,	Sept. 8	5	5	South'mpton Ord. 5 p.c. max	79—82	..	..
121,375	,,	Dec. 22	4	4	Do. 4 p.c. Deb.	72—75	..	..
350,000	,,	Mar. 8	7	7	Swansea 7 p.c. Red. Pref.	100—103*	−3	..
200,000	,,	Dec. 22	6½	6½	Do. 6½ p.c. Red. Deb.	99—102	..	..
120,000	,,	Feb. 22	7½	7½	Tottenham District A 5 p.c.	113—115	..	114
883,275	,,	,,	6½	6½	Do. B 5½ p.c.	92—95	..	..
180,000	,,	,,	5½	5½	Do. 5½ p.c. Pref.	95—98	..	..
181,368	,,	Dec. 8	4	4	Do. 4 p.c. Deb.	74—77	..	76½—77¾
298,251	,,	Mar. 8	5	5	Tynemouth Con. and New Uxbridge, Maidenhead, & Wycombe 5 p.c.	78—80d*	−2	..
289,094	,,	Mar. 8	8½	8$\frac{5}{16}$	Do. 5 p.c. pref.	87—90*	−3	..
88,230	,,	,,	5	5	Wandsworth, Wimbledon, and Epsom—	83—88*	−2	..
80,000	,,	Mar. 8	8½	8½	Wandsworth A 5 p.c.	129—134*	−3	..
255,536	,,	,,	7	7	Do. B 8½ p.c.	111—116*	−2	..
432,535	,,	,,	5/19/0	5/19/0	Do. C and New	98—103*	−2	100—100½
349,000	,,	,,	8½	6⅔	Do. Wimbledon 5 p.c.	106—111*	−2	..
98,000	,,	,,	7½	7½	Do. Epsom 5 p.c.	112—117*	−3	..
200,000	,,	,,	5	5	Do. 5 p.c. Pref	86—91*	−2	..
88,416	,,	Dec. 22	3	3	Do. 3 p.c. Deb.	56—59	..	..
284,743	,,	,,	4	4	Do. 4 p.c. Deb.	75—78	..	..

Quotations at:—*a.*—Bristol. *b.*—Liverpool. *e.*—Nottingham. *d.*—Newcastle *e.*—Sheffield. *f*—The quotation is per £1 of Stock. * Ex. div. † Paid free of income-tax. ‡ For year.